Vol. 25 SEPTEMBER, 1904 No. 145

THE FOUNDRY

PUBLISHED MONTHLY BY
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CLEVELAND OHIO

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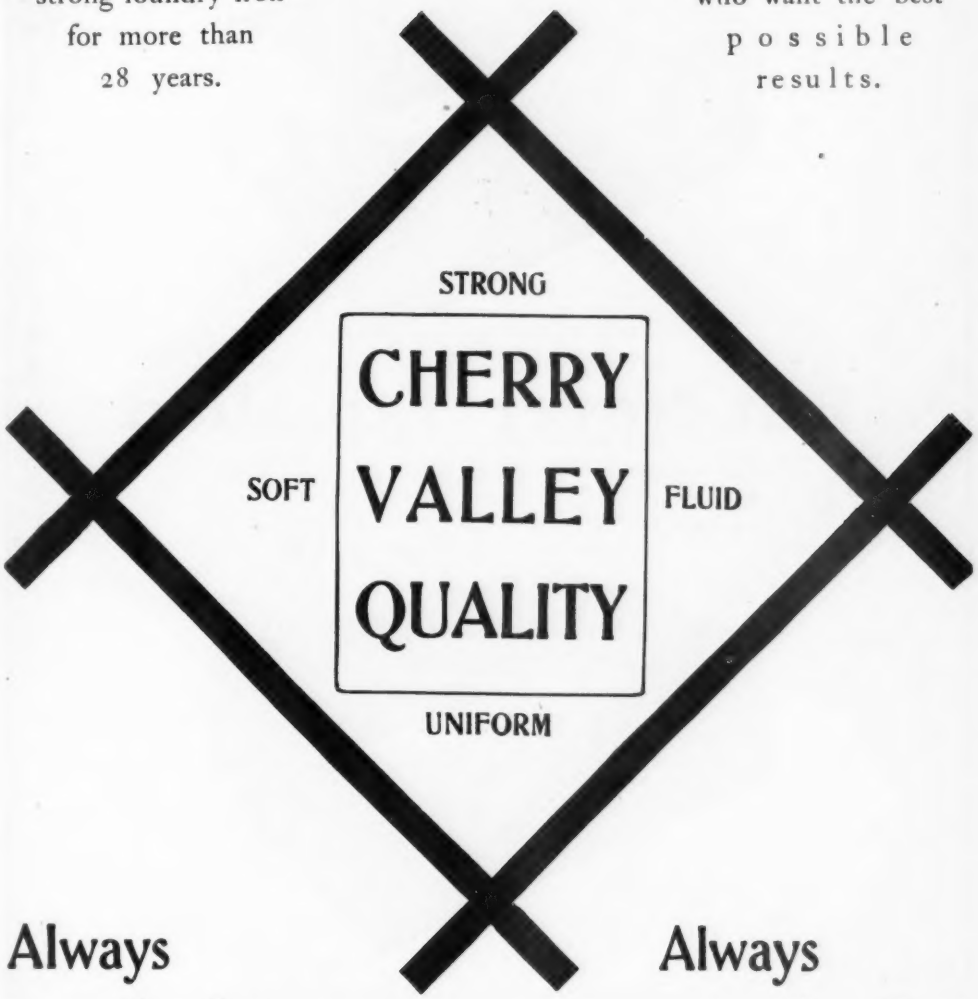

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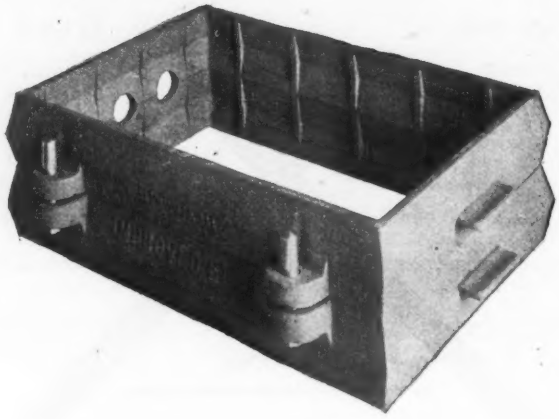
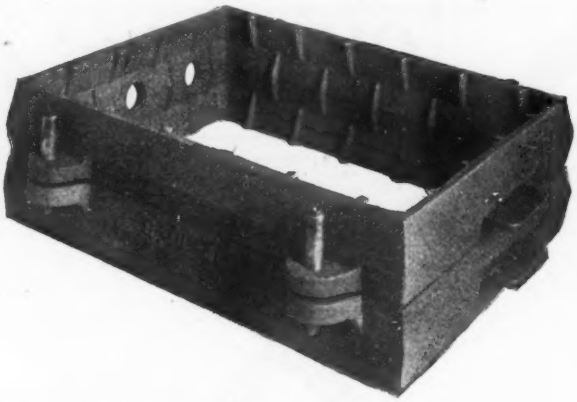


But Never Equalled

Our Improved Ribs prevent shifting and enable us to make a lighter but more rigid flask, which is an important factor even for pouring on the flat.



This lower illustration shows a "Fake" Rib Flask—The Ribs decrease the length and width, each one inch, and annoy the moulder.

Brass Founders Supply Co.

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Modern Equipment for the Brass Foundry.

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PIONEER PIG IRON

Is of the highest grade and always uniform. The ores and fuel used in its manufacture are entirely under the control of the Company and produced from their own mines adjacent to furnaces. If you use Pioneer Iron once, you will always desire to have it in your mixture. No trouble with your castings afterwards. It costs no more and is better than other standard grades. Let us have your inquiries.

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This is the Famous

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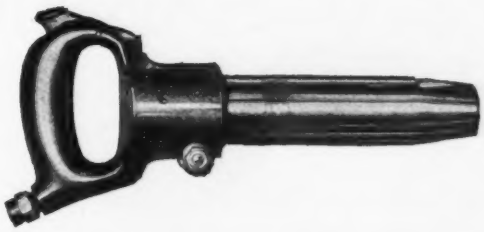

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SAND MIXER

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NOTE. — In order to clearly explain the **Modus Operandi** of this scientific and practical method of **mixing Molding Sand, Facing Sand and Core Sand,** we have issued a small pamphlet which will be sent on application.

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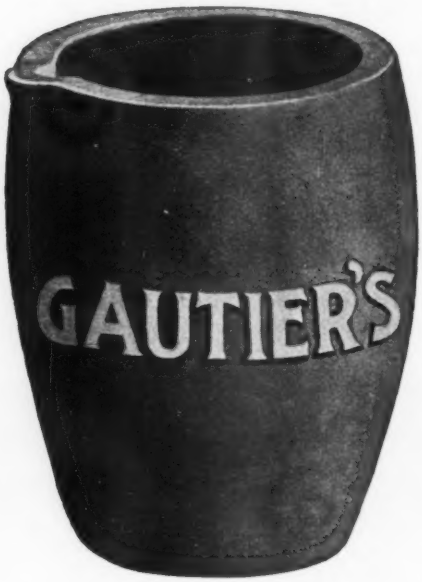

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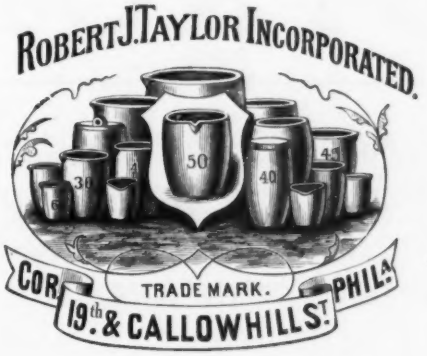

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WE INVITE YOUR INQUIRIES

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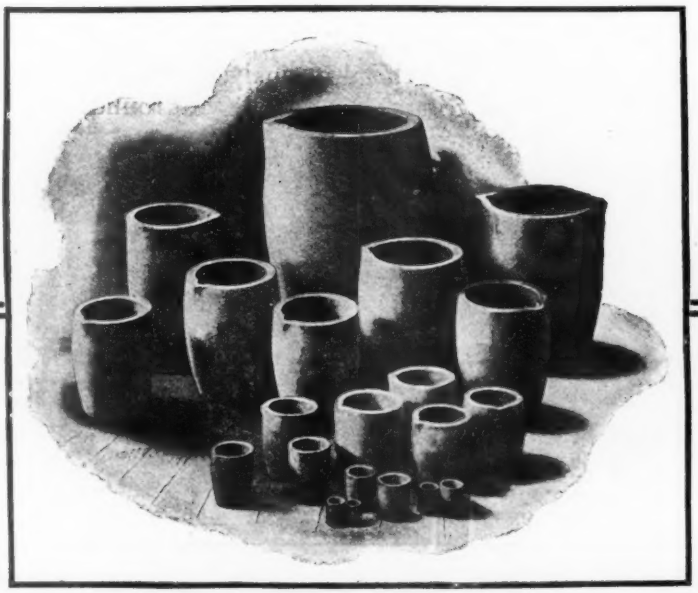

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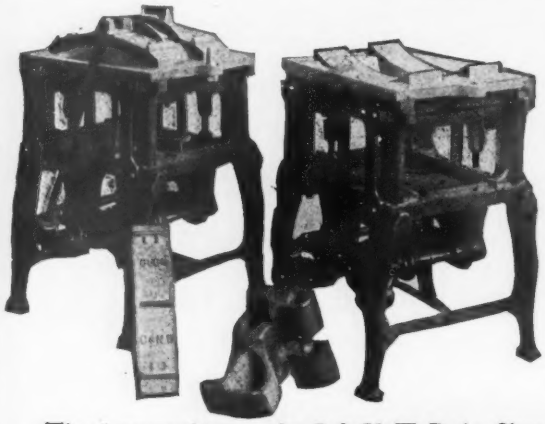
The Stratton Molding Machines

MAKE PERFECT CASTINGS OF UNIFORM THICKNESS.



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It is absolutely safe. The material and design in its construction combined with the automatic brake, gives perfect safety to men and work.

You ought to know about the "TRIPLEX."

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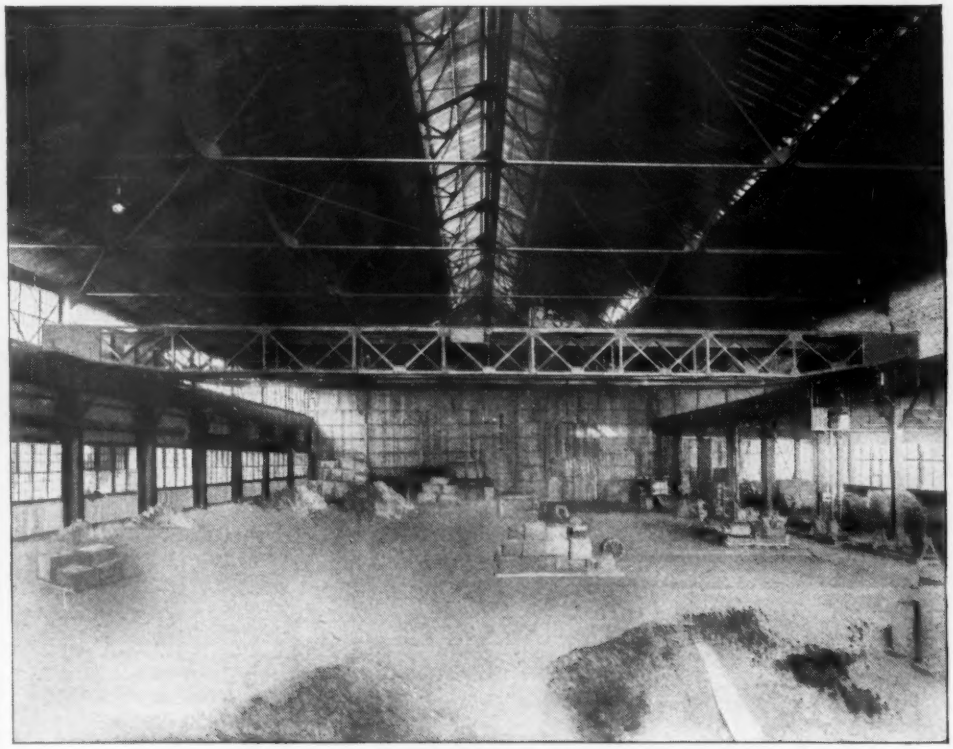

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THE FOUNDRY

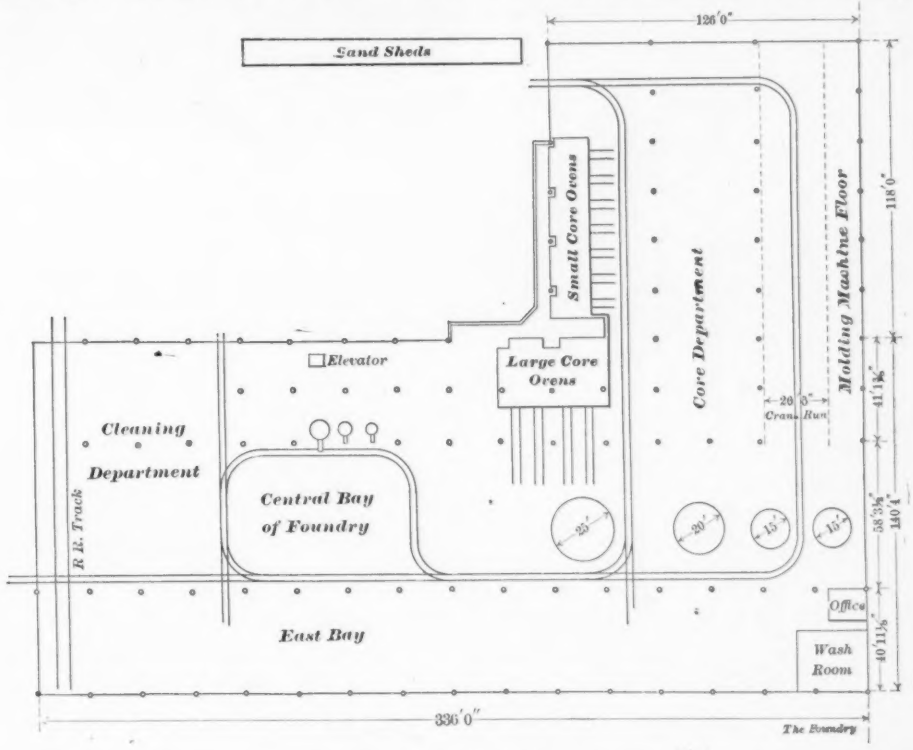
Vol. 25, No. 1. *CLEVELAND, OHIO, SEPTEMBER, 1904.* *Whole No. 145*

Foundry of Stilwell-Bierce & Smith-Vaile Co., Dayton, Ohio.

This company was formed by a combination of two old companies, the Stilwell-Bierce and the Smith-Vaile Companies. Their principal line of manufacture is pumps and water wheels, though they make a number of other specialties. Both of the lines mentioned, however, require a large number of intricate and very fine castings. In the pump work, a large number of duplicate castings are required, both heavy and light. To meet these demands, the new foundry has been so arranged that it contains many interesting features. The foundry is large, well lighted, and well laid out.

Melting Equipment.

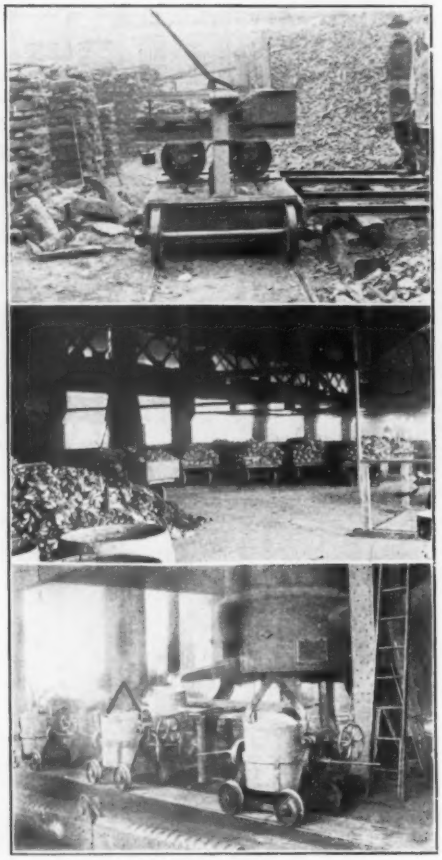
The melting equipment consists of three cupolas, one 72-inch, one 44-inch and one 30-inch. These are located on one side of the main bay of the foundry a little to one side of the center of the length of the shop, but as provision has been made for extending the foundry into the space now occupied by the flask yard, if this should ever be necessary, the cupolas may ultimately be approximately in the center of the shop. They use 16 oz. blast pressure, which is furnished by positive blowers in a room adjoining the cupolas. The blower room is connected with a tunnel leading from the central power station, and as there are steam pipes passing through this, the air in it is heated and hence usually dry. The room containing the blowers is made practically air tight, except for the entrance to the tunnel, so that the air supply is practically all drawn through the tunnel. This also has the advantage of obtaining air from a place where there is no dust to cut out the blowers.



PLAN OF FOUNDRY.

The blowers are driven from motors upon the wall back of them. The blower room also contains the testing machine as shown in the illustration.

The charging arrangements are interesting. The coke and pig iron are stored in a yard at one side of the end of the foundry and the charges made up on cars upon a transfer car. The upper surface of this transfer car is a



1. TRANSFER CAR AND SCALES IN YARD. 2. CHARGING FLOOR. 3. TRUCK LADLES.

platform scale, so that the charges are all made up by weight. The cars containing the charge are then run to the elevator and taken up to the charging floor. The charging floor is covered with iron plates, and just in front of the elevator there is located a turn table. The cars are run on to this, turned at any convenient angle and then run off so that they are arranged in rows radiating from the turn table as shown in one of the illustrations. Enough cars for a moderate sized heat can be put on to the floor before the heat is started. When the time comes for charging the iron on a car, it is run back on to the turn table, turned in line with the cupola, and run forward to the position shown by the car at the left of the illustration of the cupola charging floor.

A large portion of the iron for the various molding floors is carried from the cupola in small truck ladles upon the industrial railway. The iron from the spout of the large cupolas is received in a bull ladle from which it is poured into the truck ladles. Of course, the large crane ladles are simply swung under the main spout and filled in the usual way.

General Molding Floors.

There are two general molding floors, one in the central bay of the foundry and one in the bay opposite the cupolas. The central bay

BLOWER ROOM.

is devoted to the heaviest work and the side bay to somewhat lighter work. Both of these are shown in the illustrations. One of the most interesting features of the molding equipment in the center bay is the provision for heavy work in the shape of four large pits, the largest being 25 feet in diameter, the next 20, and the two smaller ones 15 feet. All the pits are 6 feet deep. They are made of concrete with bottoms 3 feet thick and under the bottoms are set some long eye beams with rods extending to the floor and terminating in rings or eyes a little below the floor level. These are used for bolting down bars across the top of large molds made in the pits.

Machine Floor.

In the wing which extends from the main bay of the foundry there is a large machine floor equipped with quite a variety of molding machines. Along the wall there is a row of squeezers, and next to the line of posts in the center of the wing there is a line of Pridmore

CENTRAL BAY OF FOUNDRY.

machines, while at one end of the bay there is a large Atlas machine. The latter is equipped with a sand tempering and mixing machine and an elevator for lifting the sand into the elevated bin from which it is drawn directly to the machine.

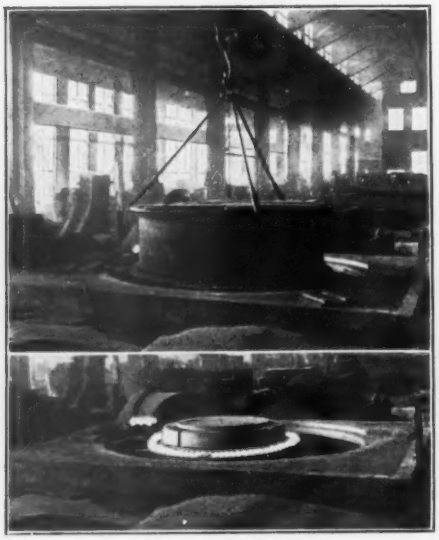
Drying Molds.

Many of the large molds for centrifugal pumps, large beds, and similar pieces, are skin dried by using special burners and natural gas. In one of the accompanying illustrations the method used for drying the center of a large centrifugal pump mold is shown. In one case the mold is stripped so as to show the burners in action. In another of the illustrations, the sheet iron covering the outside portion of the

EAST BAY OF FOUNDRY.

MOLDING MACHINE FLOOR.

mold has been removed, but the drum used for confining the heat at the center is in place, with the grab irons from the crane attached ready for raising it. One half of the core for this large pump is shown on the truck in front of the core ovens in one of the illustrations. The casting is made in two parts, and the parts subsequently united to form the entire casing.



USE OF NATURAL GAS FOR DRYING MOLDS.

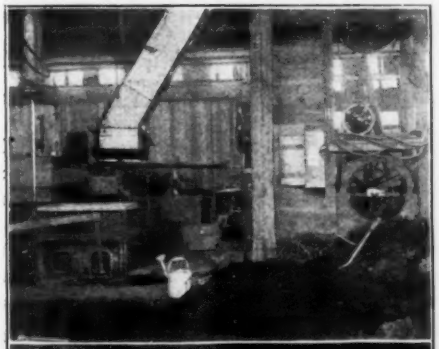
Core Department.

The core department is also located in the wing. Small cores are made at a series of benches and small stand tables. These tables consist of cast iron plates supported by cast iron columns resting upon suitable cast iron bases. The small core department is shown in one of the illustrations. The large cores are made in another part of the wing or upon the floor of the central bay of the foundry immediately adjoining the core department. There are two sets of core ovens, one for

PART OF THE CENTRAL BAY.

SMALL CORE DEPARTMENT.

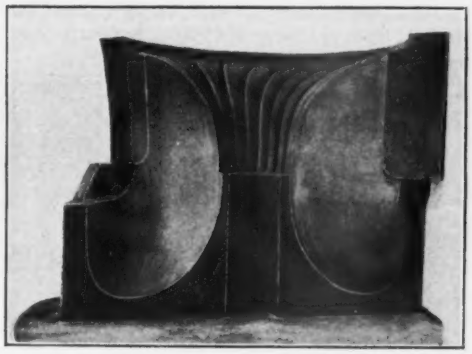
large work which opens into the main bay of the foundry, and one for small work which opens into the wing. Some of the molds, as for instance, for the water wheels, contain a large amount of very intricate coring. One of the accompanying illustrations shows a mold for a 48-inch wheel with a portion of the cores set, and a portion of them lying at the right. The cope has been raised and is suspended above the mold and the complete casting is shown at the left. Another of the illustrations shows one-half of a set of cores for one of the water wheels of a different type assembled upon a plate on the floor.



1. ATLAS MOLDING MACHINE WITH SAND MIXING MACHINE. 2. SPECIAL CORE SAND DEPARTMENT.

Sand Mixing Equipment.

As has already been stated, the large Atlas molding machine has a sand mixing and tempering equipment of its own. In addition to this, they have a very elaborate equipment at one end of the foundry, consisting of a riddle, conveyor, elevator, sand mixer and conveyors for carrying the sand to the different bins. This is equipped for mixing the general lines of facing and core sands. In addition to this, they have a small floor at the end of the core department devoted to the mixing of special core sands. These are cut and mixed by hand and then put through a Hanna pneumatic



WATER WHEEL CORES.

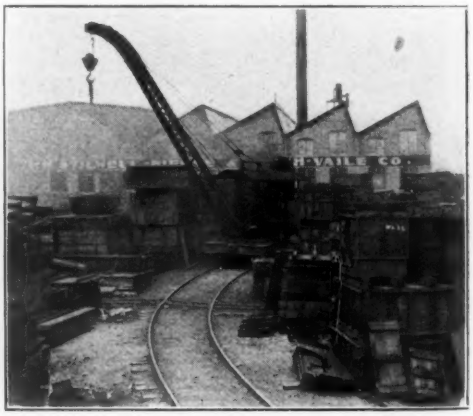
MOLD AND CORES FOR THE RUNNER FOR A 48-INCH WATER WHEEL. NOTE CASTING AT LEFT.

shaking sieve. This department is shown in one of the illustrations.

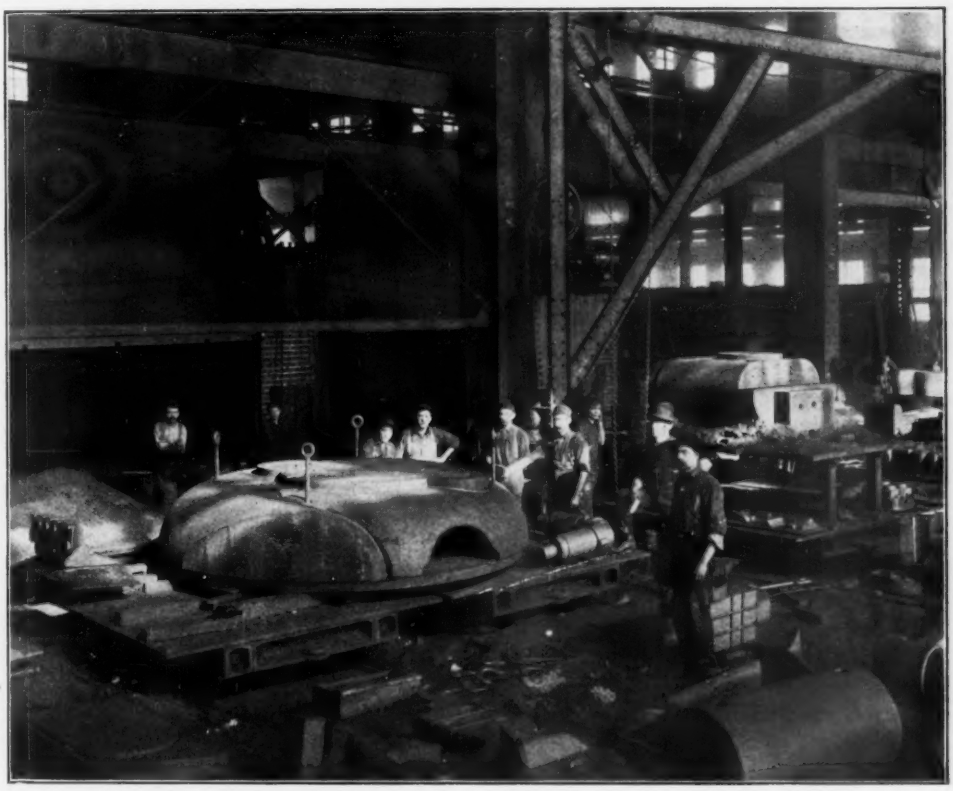
Yard Arrangement.

The yard arrangement has been carefully worked out. As already mentioned, the storage yard for pig iron and coke is on the side of the foundry adjoining the cupolas. Back of this are arranged a set of sand sheds for the storage of molding sand, and from these a run way leads into the wing of the foundry in which is located the sand tempering and mixing machinery. At the end of the foundry building proper is the main flask storage yard. This is served by both industrial and standard gauge railway tracks, the heavier flasks being arranged along the standard gauge tracks, and the lighter flasks along the industrial railway.

FLASK SHOP.



YARD CRANE.



LARGE CORE OVENS WITH CORE FOR WATER-WHEEL CASE IN FOREGROUND.

Flask Shop.

In the yard at one end of the foundry there is a small building containing a flask shop, which is equipped with the necessary machinery for building wooden flasks or repairing or putting together iron flasks. In the illustrations shown only a portion of the machinery is visible, to the left there are several other machines. A set of chain hoists arranged from suitable travelers overhead are provided for handling heavy flasks. The lumber for flasks is stored near the flask shop and by having the shop located in the flask yard it is convenient for the repair of any flasks that are being taken into the foundry for use.

Handling Equipment.

The handling equipment consists of one 20-ton and one 10-ton Pawling & Harnischfeger cranes in the central bay of the foundry, and four 5-ton wall jib cranes of their own make. These wall jib cranes can be moved from one pillar to another by an overhead traveling crane and it is possible to move one of them the entire length of the shop and have it in place ready for operation in four minutes.

In the east bay of the foundry there are three 5-ton Pawling & Harnischfeger cranes. In addition to this there is an air hoist in front of each core oven and a traveling pneumatic crane over the Pridmore and Atlas molding machines. The industrial railway serves all of the different floors ot the foundry and as has already been mentioned is used for taking the iron to different floors in ladle cars. The standard gauge track enters the foundry at one end. They have a locomotive jib yard crane which can enter the foundry, pick up a flask and carry it out and deposit it at any point in the yard within reach of the standard gauge track. All of the heavy flasks are handled in this manner. This crane, together with the arrangement of the heavy flasks is shown in one of the illustrations.

General Remarks.

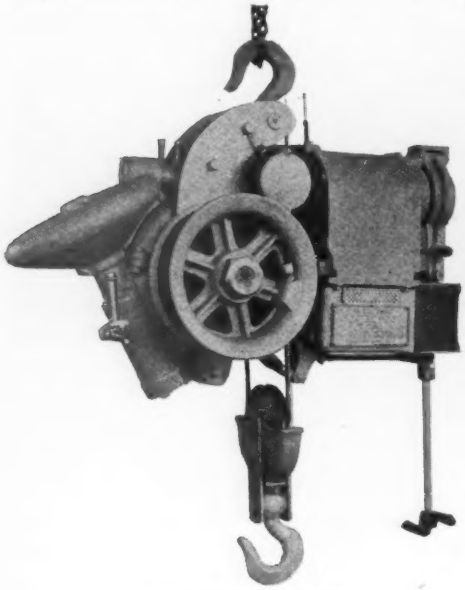
The foundry office is located in one end of the foundry. At this end are also located the lavatory, time clocks, etc. Over the office there is a loft for the storage of patterns which are in almost constant use, and there is one man who looks after all the patterns

to see that they are taken care of in all cases.

One interesting fact is that when they have large brass castings up to 6,000 pounds, they melt the copper in their small cupola and add the other material for the alloy in the ladle.

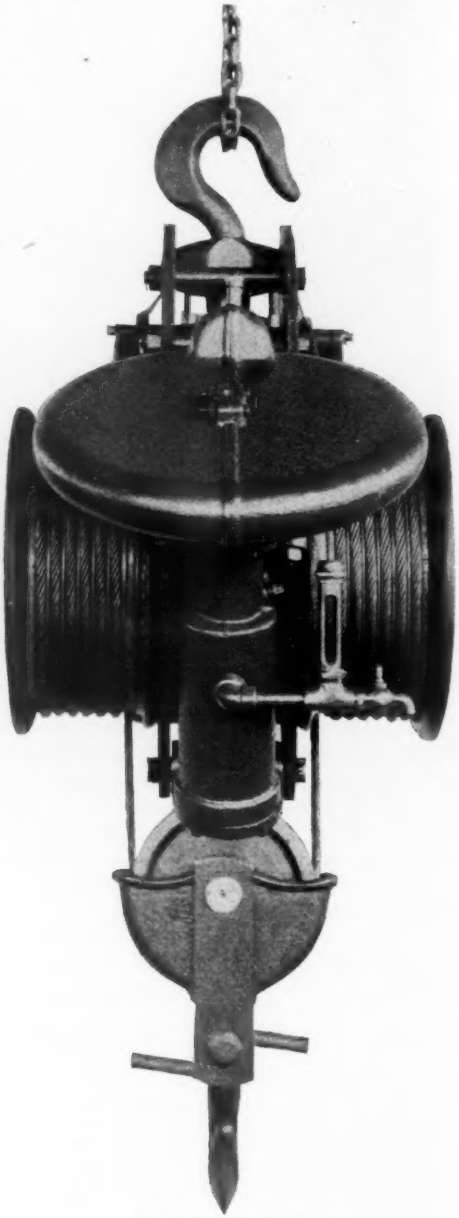
A NEW ELECTRIC HOIST.

The conditions of the hoisting problem in the foundry are always exacting, on account of the heat and the dust. Then, too, any chain hoist is likely to have more or less of a jarring action, which tends to shake the sand out of the molds. The Yale & Towne Mfg. Co., of Stamford, Conn., have spent a great many years in a careful study of the hoisting



A NEW ELECTRIC HOIST.

problem. They were among the first to develop a successful traveling crane and after they sold their traveling crane business to the Brown Hoisting Co., of Cleveland, O., they turned their entire energy to the development of their chain block and similar hoists. The result was the development of their highly effective "triplex" chain block. They have now come forward with another hoist, which is evidently capable of keeping up their reputation for first class appliances. This is an electrically operated hoist and is shown in the accompanying halftones. It will be noticed that the motor and hoisting mechanism are so arranged that they balance each other on opposite sides of a line from the supporting hook to the hoisting hook. It will also be noticed that the hoist requires a remarkably small amount of head space. Such a hoist, supported from a suitable trolley or traveler, will certainly be found a very efficient addi-



A NEW ELECTRIC HOIST.

tion to any foundry equipment. It is controlled from the floor by means of an extension or telescope rod, which operates the controller. The amount of head space re-

quired for a given lift is very much less than that required for the pneumatic hoist, and as all of the parts are thoroughly encased and protected from dust the wear upon the machine should be very slight. The device is manufactured by the Yale & Towne Mfg. Co., Stamford, Conn.

WARPING OF CASTINGS.

BY THOS MACK.

The warping of castings, owing to variations in the thickness of metal, is an obstacle quite often encountered by the patternmaker, and one not always considered by him until his attention is called to a badly warped casting and he is asked to explain its cause. The chances are that too often he will say "Consult the foundry foreman, for he is to blame. They probably lifted the cope off too soon." Or he will make some similar statement.

A good illustration of this kind came under the writer's observation not long since, when a casting like that shown in Fig. 1 was to be made. In this illustration the casting is shown by the full lines distorted as it came from the mold, and the dotted lines show the outline of the required casting. The distortion has been exaggerated for the sake of making it plainer in the illustration. This was one of four sections for a floor plate, as used in machine shops doing heavy work, and when placed together the four pieces form a surface of 1,024 square feet, each section being 32 feet long, 8 feet wide, and 16 inches in depth. Each casting weighed 22 tons. In the flanges and lower part of the casting the metal was 1⅜ inches thick, while in the upper surface, which contained the T slots for the bolt heads, it was about 4¾ inches thick.

On inspecting the first casting, it was found to be warped as shown in Fig. 1. This warping amounted to 1⅝ inches in the length. An attempt was made to straighten the casting by heating, but it was finally rejected and broken up for scrap.

The cause of the casting warping to such an extent was then discussed and the conclusion reached that, owing to the upper part of the casting when molded being of a much lighter section, it cooled first. Also the cores for this section tended to counteract shrinkage. Later, when the heavy surface containing the slots for the bolts cooled it shrunk and sprung the upper surface out of true as shown. Of course the piece was molded with the heavy face down in order to secure good metal for finishing.

To avoid this warping it was decided to rebuild the pattern which was constructed as before, in length about 12 inches longer than one-half of the required casting, only that the surface of the pattern was made to conform with the warped surface of the first casting, except that the pattern was warped in the reverse direction. This pattern is shown in Fig. 2, the warp here also being exaggerated for the sake of clearness. When the castings from this pattern were taken from the mold they were all that could be desired as none of the four varied more than ¼ inch.

In making the mold a hole was dug for the total length of the casting and a half pattern placed in one end of this hole with one end blocked up to the required height. It was then rammed and tucked up and the two sectional cover flasks A and B placed in position and rammed up with the parting between them as shown. Wing bars were bolted to the outside of the flasks to support this overhanging

Fig. 1

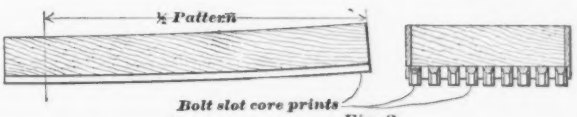


Fig. 2

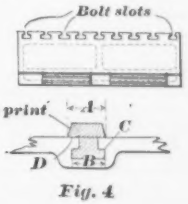


Fig. 4

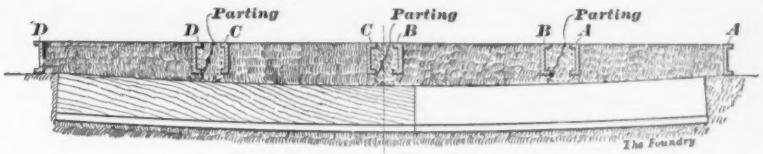


Fig. 3

sand. The parting was made at an angle so as to allow the flasks to be lifted off and replaced separately. The ramming of this portion of the pattern being completed, the flasks were lifted off and marks made on the mold opposite the center of the pattern, the pattern drawn, turned end for end, and placed in the opposite end of the hole, care being taken to see that the center line of the pattern came opposite the mark made on the side of the mold.

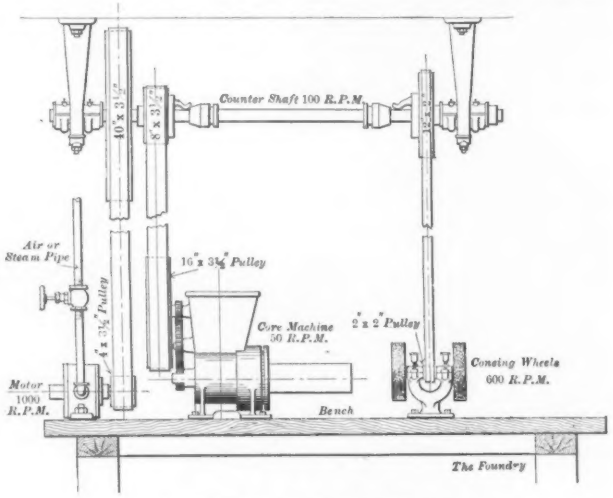
As the pattern was constructed 12 inches longer than one-half of the casting, this insured a 24-inch bearing upon the portion of the mold already completed, and thus assisted in lining up and setting the pattern for the second half. After the pattern was in place and tucked and rammed up, the flask B was returned to its place, and the flasks C and D placed successively in position and rammed up, the partings being made as shown. The flasks were then lifted off, the pattern drawn, the mold finished, the cores set, gates cut, and all made ready for pouring. In Fig. 3 the pattern is shown in its second position in the mold.

In order to avoid the use of a large number of chaplets on top of the cores for the T slots, a very simple device was resorted to. This is illustrated in Fig. 4, which shows a cross section of the T slots with the core print drawn above it. It will be noticed that the core print is wider than the T slot, and hence when a core of the cross section of the core print and T slot is placed in the opening made by such a core print, and the metal flows into the mold, there will be more area exposed in the width A than in the width B, and hence the metal which exerts a lifting force under the overhanging portions C will be more than balanced by the metal bearing down on the portions D. When cores are made and carefully set according to this system, no chaplets will be needed on top of them, and of course after the entire core is submerged it will be held down by the metal above it. The cores for forming the interior of the casting between the ribs were made separately and set in place before the mold was closed.

The interesting point in this matter is the fact that the pattern had to be sprung a certain amount to overcome the spring which would naturally result in cooling. The exact amount that any pattern will have to be distorted to accomplish this result can only be ascertained by experiment, though experience will enable a patternmaker to make a very close approximation at the first trial. The depth of cope used may in some cases have an influence on the results.

A NEW MOTOR FOR FOUNDRY USE.

With the introduction of machines for forming cores and of grinding machines for pointing or coning the same, it has become necessary to install some kind of power in the core room. In many foundries the core room is located so far from the general power appliances that it is impossible to carry the necessary power there by shafting and belts, but as almost all foundries are equipped with steam or compressed air, the Falls Rivet & Machine Co., of Cuyahoga Falls, O., has designed and placed on the market a small motor to be operated either by steam or air, which can be installed in the core room and operate the core machine and the grinding wheels for coning the cores.



A NEW MOTOR FOR FOUNDRY USE.

Such an outfit as this installed in the core room of a foundry should prove itself an exceedingly good investment, on account of the fact that it will greatly increase the output.

The Universal Caster & Foundry Co., will make important additions to its plant at Newark, N. J. The principal building will be 41x60 ft. three stories.

POINTS FOR BRASS FOUNDERS.

BY A PRACTICAL TRAVELING MAN.

A monkey was once left in a country grocery store to have things his own way during the absence of the grocer. Starting with the barrel of cider, he commenced a combination mixture of raisins and currants, then cut up some apples, poured in a little of all kinds of spices, cinnamon, and various other ingredients; and then, to finish the lot, he chopped up some meat standing by on the chopping block, and added it to the already complicated mixture, when he discovered the grocer entering the store.

This grocer's wife was an adept at making pies, and had the royal palace order to supply the King. Thinking she was making raisin pies for the King's order, this same mischievous monkey took from the contents of the barrel he had mixed and put it in the pie crusts, when the faithful grocer's wife baked the pies and delivered them to the King on his order, believing she had furnished the right article. Thus we have the legend of the origin of mince pie. All other combinations of mince meat are taken from the monkey legend.

During the past twenty years, wise men have been "monkeying" with metal combinations, and making all kinds of fabulous claims for them. The enterprising people, willing to concede the many great things of the inventive minds, allowed these various combinations to be manufactured into the different articles of use where they thought they would be most beneficial. Perhaps my readers can see what I am getting at. From time to time these contraptions and concoctions have been cast aside, and at this, the beginning of the twentieth century, have come into view again in the harmless looking scrap pile. It would puzzle the best chemical skill to determine accurately what all these combinations contain. So much for scrap.

A good many founders throughout the country have to resort to the scrap pile in order to compete in prices with others. No brass foundry can be run successfully and profitably, as I have stated in previous articles, without using scrap, but too much is expected.

I notice one of our readers asks a question as to what he should use for facing his molds, so as to get nice bright castings. The answer given by some expert says that he should use flour, and he names several articles. They have been tried, but the good castings failed to appear. Now, my reader, the trouble is not in the parting of the mold, or facing with plumbago, and other valuable facings, or with sand, while the sand has a good bit to do with the production of good castings, yet the material is the principal thing. If you want gold to look like gold and shine like gold, you must use gold. If you want a nice red metal casting to look pretty when shaken out of the sand, you must use 80 parts of copper, 10 parts of zinc and 5 parts each of tin and lead, made from new materials, or the same composition used with about 25 percent of this miscellaneous scrap added, and the results will be good, but do not expect to make good work with poor metal.

It would be far better to have a standard composition made in ingot form by a responsible smelting works than to resort to the scrap pile without the proper knowledge of how to use it. There are a large number of different formulae, all of which produce nice castings, and some are largely composed of scrap metals, but as I have previously stated in the legend of the monkey, this mince meat preparation and the scrap pile of the twentieth century are of a similar construction. So the wisest thing for the modern up-to-date brass foundrymen, will be to determine the nature of the old metal pile, and see just how far he can go in the use of the same and still do good work. Of course for some work, "any old thing" will do.

Thomas Lowry, of Minneapolis, has purchased the property at West Duluth, known as the old car works, owned by the Metropolitan Life Insurance Co., New York, which acquired it through defalcation on a mortgage. The plant includes a rolling mill with two trains of rolls; a foundry, 60 x 400 ft.; erecting shop, 100 x 600 ft.; a blacksmith shop, 75 x 150 ft.; and engines with a capacity of 1,200 horsepower and eleven boilers. Mr. Lowry has not announced what use he will make of the plant.

After two months' shutdown the Columbus Malleable Iron Co. has resumed operations. Some of the workmen have been idle since the beginning of the year.

The Ensign Foundry Co., Toledo, O., will purchase a jib crane, Root or Connersville blowers and possibly two more rattlers. The new foundry, now being constructed, will be 80 x 164 ft.

THE FOUNDRY.

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ANNOUNCEMENT.

Mr. George H. Gardner, who has been president of the Iron & Steel Press Co. since its organization in March, 1901, has resigned that position and severs his connection with the company this month. Under his administration *The Foundry* has made steady progress and his withdrawal from the company is sincerely regretted by his associates. His plans for the future are not yet matured, but whatever field may enlist his energies he will carry into it the hearty wishes of *The Foundry* staff for his success. Mr. Gardner's successor as president of the company is Mr. John A. Penton, founder of *The Foundry*, who needs no introduction to *Foundry* readers. His long connection with the foundry trade is well known and his acquaintance among foundrymen is world-wide.

TRADE OUTLOOK.

While this month has not seen very much change in the foundry situation, there is nevertheless a good deal of interest to report that has a more or less direct bearing on the foundry trade. The recent reductions in the price of steel, which have brought billets down from $23.00 to $19.00 per ton, and the corresponding declines which are occurring in some finished products, will not affect the price of pig iron, on account of the fact that practically all of the prices on the commodities mentioned have been maintained by pools and combinations, or by the practical control of the market by a few large producers.

The conditions in regard to pig iron have been very different. The price of pig iron has been fixed entirely by supply and demand, so that when it would reach a point close to the cost line, the furnace men were forced to reduce their costs or go out of blast. The readjustment of various matters about the furnace and the price of ore have gradually brought the price of pig iron down to the present standard. Northern furnaces are selling at from $11.50 to $12.00 per ton for No. 2 foundry iron, and this price is so low that the southern furnaces cannot compete in most of the northern manufacturing centers.

The southerners are handicapped by unsettled labor conditions at the mines, and hence many of the furnaces are out of blast, and those that are running do not think it safe to contract for extensive future deliveries. The southern furnace men are holding No. 2 foundry iron at $9.50 per ton at the furnace.

From inquiries made in various quarters, it is evident that only about 45 to 50 per cent of the foundry capacity of the country is now active. We know that some contracts have been made recently, in which the price for the castings was about one-third less than that received in the middle of 1903. It is evident that if the foundryman has to make this great reduction in selling price, correspondingly great reductions have been necessary in production costs, in order to keep the plants going.

The Pennsylvania tunnel castings, which have been a factor in the market for so long, have now practically all been let. The North River contract consists of 26,000 tons of lining castings let to the Wheeling Mold & Foundry Co., Wheeling, W. Va., and about the same amount to the New York Car Wheel Works, at Buffalo, N. Y. There are also 12,000 tons of screw piles, which were let to the Philadelphia Iron Works Co., of Philadelphia, as mentioned in our July issue. The East River, or Pearson contract, consists of 108,000 tons, of which 54,000 tons were secured by the Davis & Thomas Co., Catasauqua, Pa., 27.000 tons by the Buffalo Foundry Co., of Buffalo, N. Y., and 27,000 tons by J. B. & J. M. Cornell, of New York City. Contracts have been made for pig iron to cover all of these contracts for castings.

AS SEEN FROM ABROAD.

The Iron and Coal Trades Review, an English contemporary, in reporting the recent meeting of the British Foundrymen's Association, quotes Mr. Buchanan, the president, as stating that he had held a conversation with a prominent American recently, who said that

he did not see why there should be any feeling of depression among the British shops. It is stated that the American had wide spread knowledge of American works and had visited many English works, and to his mind the English were advancing more rapidly than the Americans, and from what he saw the English were liable to get ahead, on account of the fact that the Americans had gotten into the happy frame of mind where they thought they could sit down and rest until the rest of the world caught up.

If any such condition as this actually exists, it is certain that it is high time for the Yankee to bestir himself once more and keep ahead of the procession. The factor that has put American manufactures in the lead has not been competition abroad, but competition at home. Foreigners have frequently commented upon the fact that the Americans were practically the only exporting nation who did not try to furnish those abroad with exactly what they wanted, but that we tried to force our American machines on to the foreigner without adapting them to his wants. There has undoubtedly been some truth in this in many lines but it is probably true, nevertheless, that the real reason for the American machine going abroad is that it has stood the test of extremely keen competition in this country. In this connection it is interesting to note that a prominent German foundryman who was in our office recently stated that American molding machines were almost as well known in Germany as in America, and that there was scarcely a prominent foundry in Germany which did not contain some American machinery. The mere matter of export of a few molding machines is a very small thing compared with the fact that American molding machines and foundry methods are being copied very largely abroad, and this seems to indicate that our friends on the other side appreciate the fact that we have a few good things over here. We must remember, however, that the period of decay in any nation has always been the period of prosperity following the wars and troublous times which made the country great, and if our internal war of competition is stopped by the rapid growth of the great combines which control and suppress the independent operator with his versatility of design and rapid change of product to which he has been forced by competition, we may find ourselves in the position that this English paper speaks of. Even if large interests do control large portions of the output, we feel that these interests should take care to see that their engineering forces are so organized that there will be some competition between the different works, which will result in constantly raising the standards of the methods and product.

CONSUMPTION OF SAND IN THE FOUNDRY.

The editor of *The Foundry* has been trying to get some reliable figures concerning the consumption of sand per ton of castings for various classes of work and hence is very glad indeed to publish the following tables, which were sent in by R. Hunt & Co., Ltd., Earls Colne, England. The tables as sent in were in long tons, but we have reduced them to tons of 2,000 pounds, as in this country finished castings are generally rated in tons of 2,000 pounds, and in many cases molding sand is sold by this rating.

We wish other foundrymen who have kept records would give the results of their experiences. The fact that the consumption is above or below these tables may not signify as good or better practice. We can readily conceive of a case in which a large amount of cheap sand which burned out quickly could be used to advantage while if the sand were higher in price it would be expected to possess more lasting qualities. The price and quality of the sand ought to be stated in the case of any comparisons.

Consumption of Sand per Ton of 2000 lbs. of Castings.

FOR IRON CASTINGS.

Year	Sand Used. Tons.	Castings Made. Tons.	Sand per ton of Castings Tons.
1901.....	350.56	2,142.56	.1925
1902.....	384.16	2,176.16	.1975
1903.....	380.8	2,458.4	.183
Total....	1,115.52	6,777.12	.573
		Average,	.191

FOR BRASS CASTINGS.

Year	Sand Used. Tons.	Castings Made. Tons.	Sand per ton of Castings Tons.
1901.....	17.92	35.84	.56
1902.....	20.16	40.32	.56
1903.....	20.72	41.44	.56
Total	58.8	117.6	1.68
		Average,	.56

SOME EXAMPLES OF IRREGULAR DISTRIBUTION OF SULPHUR IN PIG IRON.*

BY JOHN J. PORTER, DUBOIS, PA.

The writer recently carried on a series of experiments involving the analyzing for sulphur of a large number of pigs of iron. While the original object of the experiments was not obtained, some rather remarkable cases of segregation of sulphur in the pigs were encountered, and these it is thought will interest the foundry metallurgist and others having to sample pig iron.

The fact that sulphur will seldom be uniform throughout the cross-section of a pig, has long been known. Mr. West, in his book on the Metallurgy of Cast Iron gives a number of instances showing sulphur to be highest in the top of the pig, and also states the reason for this phenomenon: namely, that sulphur (or sulphide of iron) being lighter than the iron itself, tends to rise through the molten metal and evaporate from its surface. The formation of a solid crust, however, prevents this escape, and causes the accumulation of sulphur near the top of the pig.

*Paper read at A. F. A. convention, Indianapolis, June, 1904.

An illustration of this loss of sulphur from the molten iron occurs in the fact quite generally recognized among furnacemen, that the sulphur is, as a rule, slightly lower in the pigs than in the laboratory samples, which are dipped from the iron as it leaves the furnace and cast into chill molds to quickly solidify them. The segregation of sulphur is also well known among the furnace fraternity, and in consequence many of our chemists make a practice of drilling in or near the bottom of the pig when getting samples.

It is, however, the belief of the writer that it is not generally recognized how great the variation in sulphur may be in a single pig, and for this reason the accompanying diagrams are offered.

PERCENTAGE OF SULPHUR.

	Pig A.	Pig B.	Pig. C.	Pig D.	Pig. E.
Hole No. 1—Top.	0.115	0.058	0 066	0.165	0.116
" " 2—	0.125	0.058	0.061	.....	.....
" " 3—	.....	0.052	0.061	.....	.....
" " 4—	.....	.....	0.084	.....	.....
" " 5—	.....	.....	0.059	.....	.....
" " 6—Bottom.	0.040	0.030	0.029	0.175	0.103

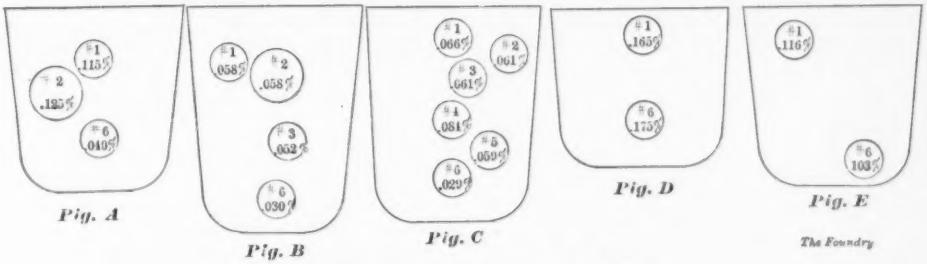
HOLE A. TOTAL DEPTH 2 INCHES. PERCENTAGES OF SULPHUR.

Sample Number.	Evolution Method.		Gravimetric Method.		Average.
1, First ½ in.	0.121	0.117	0.119	.....	0.119
2, Second ½ in.	0.111	0.110	0.115	.....	0.112
3, Third ½ in	0.103	0.106	0.108	0.102	0.105
4, Fourth ½ in.	0.103	0.100	0.099	0.101	0.101
HOLE B. TOTAL DEPTH 1½ INCHES.					
1, First ½ in.	0.048	0.048	0.050	.....	0.049
2, Second ½ in.	0.047	.....	0.045	.....	0.046
3, Third ½ in.	0.043	.....	0.040	0.045	0.043
HOLE C. TOTAL DEPTH 1⅛ INCHES.					
1, First ⅜ in.	0.117	.....	0.118	.....	0.118
2, Second ⅜ in.	0.132	.....	0.126	.....	0.129
3, Third ⅜ in.	0.131	0.133	0.131	0.134	0.132

This table shows the variations in sulphur in cross section of pigs, the numbers of holes refer to accompanying diagram. These pigs were each from a different cast of foundry iron, the silicons ranging from 1.50 to 4.00. the manganese about 1.50, phosphorus .40, and total carbon around 4.00. All the sulphur determinations were made in duplicate, by the evolution method, without previous annealing of the drillings, and in several cases were checked with gravimetric determinations.

It may be of interest, in passing, that the iron from this Virginia furnace running on native ores, invariably evolved *all* its sulphur as hydrogen sulphide without previous annealing, as shown by the close agreement with the gravimetric check analyses which were frequently made.

The analyses show plainly the great importance of the method of drilling in taking commercial samples. Pig A, for instance, showing three times as much sulphur in the top as in the bottom, while Pig C might be given any grade from grav forge to No. 1, according to where it was drilled. In this connection a standard method for sampling becomes quite apparent. It will be noticed that no invariably correct rule can be given as to the point of highest sulphur in the pig, for while it is usually found in the top, in No. D the reverse is the case, and in pigs A and C it occurs near the center.



DISTRIBUTION OF SULPHUR IN PIG IRON.

The writer has also noticed an apparent variation in the sulphur lengthwise of the pigs, as well as in the cross section. Having obtained drillings from the same hole in the same pig upon several different days, and finding that these drillings, when analyzed separately, would not check in their sulphur, a few experiments were made along this line, with the following results:

These holes were all drilled parallel to the longitudinal axis of the pig, and the results are given in detail so that some idea of the probable error of the analyses may be obtained.

Considering the fairly close agreement of the duplicate analyses by different methods, it would seem as if the variation in the percent of sulphur, shown by the different samples from the same holes, could only be due to longitudinal segregation. This variation, however, at least in the cases here noted, is not sufficient to be of great commercial importance, but, nevertheless, of scientific interest.

THE FOUNDRY APPRENTICE AS SEEN IN ONE SHOP.*

BY CHAS. H. THOMAS, NEWARK, N. J.

This is becoming a serious subject. Where are the molders of the future to come from? In our larger cities it seems almost impossible to get good material for the purpose. Recently we advertised for two apprentices in one of our daily papers. We received one reply. We arranged for an interview, and the applicant put in his appearance. He was a likely young man of 17. His father was a saloon keeper, and the boy was so desirous of getting out of a business so disagreeable that he was anxious to start the next day to learn the foundry business in all its details.

I informed him that no matter what the nature of a business may be, it should be thoroughly investigated and thought over, before a final decision was reached. I invited him to visit the foundry the next day. I gave him full information as to the duties, the nature of the different classes of work, etc., so that he would have the situation before him, as it really was. His wages were to be 80 cents a day the first six months, 90 cents the second six, and so on until the end of his indenture. Moreover, should he show adaptability, the raise would be higher, depending upon his output and the quality of the work he turned out. He appeared pleased and desired to start the next day—but, alas—that tomorrow never came.

After leaving, he had evidently digested more thoroughly what I had told him. Four years looked a long way ahead. He never started, and will probably graduate as a crapshooter, and eventually become a Tammany leader or perhaps worse. We have had four boys since, three of them only stayed a day or two, and the fourth, with Teutonic persistence, is still here and doing well, with

* Paper read at the A. F. A. Convention at Indianapolis, June, 1904.

every promise of becoming a first-class mechanic.

Why is it that we cannot keep apprentices? We pay them all holidays and overtime. We make life pleasant and agreeable, and give better pay for better work, "and still some are not happy." Is it the trend of the times, or not? Who can say? But we do know that the boy of today wants more money for doing nothing and spoiling a lot of work than did the boy of a quarter of a century ago. Because the ways of spending money are today more numerous, dissipation more common and deplorable, that is no reason why the boy of today should be worth more than formerly. Cigarette smoking, immorality, emulation of the gilded youth who belongs in the reform school, and other pernicious habits, sap the energies of the average young man who presents himself at the foundry and render him unfit for the labor required there.

Where, then, are we to recruit the molders of the future from? The American city boy, with but few exceptions, shuns all labor meaning exertion. We must look to the country, or to the influx of foreign youths with an inborn desire to be independent and be masters of a trade.

As we all know, the foundry trade is one requiring more than the mere pounding of sand. The boy from the country may or may not make a good molder, but he is sure to be a jack-of-all-trades, and as such he has a good constructive ability, becomes a good mechanic, and if not too smart, will become valuable to his employer, only to some day become an employer himself.

The youth who leaves his native country to prosper here has a hard row to hoe, being handicapped by lack of knowledge of the language and ways of this country. But it is a good school for him, and with his usually very frugal habits he lays by a little all the time for a rainy day, and by the time he is Americanized, he has a trade and some coin of the realm.

If we are asking ourselves as a nation—Whither are we drifting? So does the foundryman ask himself—Where are not only our future but even the present generation of good molders to come from? Where do they all go to? We never see many old men working on the floor, and very seldom hear of a molder dying. What becomes of them? Except in times of depression, there is also a scarcity of good molders.

It is quite evident that foundrymen must recruit their apprentices from the available surrounding material, and inducements must be offered to them, of such a nature that they will have their attention riveted, and strive to reach the goal as rapidly as possible. The foreman must take the boy into his confidence and not allow him to go to a molder for his information at all, or allow the molders to make suggestions to him. I have tried this method with conspicuous success.

I tell the boy what facing to use, where to set his sprues and risers, if any; how to cut his gates; and then leave him alone until he gets stuck and asks for aid. Then I take him all through the part of the work he has done right, up to the point where his difficulty commenced, make several suggestions as to the different ways in which the job can be secured, and ask him which would seem to him to be the quickest and best. If he does not select the best way, I suggest it to him. If there are more than one off the pattern, and there are several ways to do the job, I advise him to try each a different way, and let me know the result. When he makes his report he has had time to think, and generally has selected the easiest way suggested. With a smile, he says that it seems twice as easy when he knows how and that he can make the next one in very much less time, invariably doing so, if not interfered with by the molders.

I praise his castings when they are turned out clean and sound, and when a bad one is made, the boy and I hold a post-mortem examination on it, decide upon the fault, and look for the remedy. These are things that boy will never forget. In this way I try to have the good and bad results leave a permanent impression.

As the boy advances, we give him a chance to make extra time, and it is surprising to note the special energy an hour or two a day put in by the boy when a job is given him which will keep his mind occupied and hustling. We make it a practice of paying our men for what they do in the way of good work. We never allow a boy to close a poorly finished mold. He must learn to make a neat, clean mold, before he can attain speed. He is told that a neat, clean workman can always be picked out by his personal appearance, and the condition of his floor and tools.

Just as soon as the boy begins to show an improvement, we start him ahead by giving him better and better work, not forgetting the little raise from time to time with the extra accompanying it, the idea being to keep the boy

No. 605, 763
DETROIT, MICH.

satisfied. It is surprising to see how they will vie with each other to get out the best job in the shortest time. This may sound like a fairy tale, but can be readily verified by personal inspection any day.

Now for the very important matter of the apprentice ratio. The Molders' Union allows one for the shop and one for every eight molders. In other words, that which was good enough forty years ago, but is obsolete now. The foundrymen are wanting one to six, but this like other modern ideas the molders will not give. Nevertheless it is a question for concerted action by both parties, and the nearer the apprentice ratio is brought to one to five the better, even if the apprentice be adjudged proficient in one or more branches of the trade only. If the ratio is not increased, and the trade itself made more attractive to the young man, the scarcity of good molders will soon become a calamity.

While we cannot have Brussels carpets in the foundry, we can clean up at least once a week, and thus teach boys and men the value of being systematical. Start the boy with a trial of two months, and if in that time he does not show his adaptability as a mechanic, he never will. We do an act of kindness in advising him to make an effort elsewhere. On the other hand, when we find a boy who by industry and energy forges ahead, and who desires to learn, we do him a gross injustice to keep him on one class of work because we may happen to make more money out of him that way. The apprentice should be given the best work in the shop, as soon as he shows that he is able to tackle it. We contract to teach the boy a trade. If he is bright, push him along. If he is dull drop him, as he will only become another candidate for the minimum wage. What we want is maximum days' work, with maximum days' pay, and none of the other. Only then will the laborer be worthy of his hire.

COREMAKERS' APPRENTICESHIP PAPERS.

Some time ago two sets of coremakers' apprenticeship papers were presented at a meeting of the New England Foundrymen's Association. One of these was presented by Mr. Viall, of the Brown & Sharpe Mfg. Co., Providence, R. I. As a result of the discussion which occurred there and further consideration on the part of the Brown & Sharpe Co., the following apprenticeship contract has been adopted by that firm for coremaker apprentices, and we are glad to present it in the hope that it will be of interest to others in the foundry business.

Core-Maker's terms of apprenticeship to the Brown & Sharpe Manufacturing Co., Manufacturers of fine Machinery, Machine Tools, etc. Providence, R. I.

Applicants for admission to apprenticeship must be not less than eighteen (18) nor more than twenty-two (22) years of age. They must be physically sound, of good moral character, and have received an education equivalent at least to that required for graduation from the public grammar schools of the city of Providence.

Application must be made in person; and, if accepted, the applicant's name will be registered and due notice given when he will be required to commence work.

The first four hundred and eighty (480) hours of service shall constitute a term of trial. If the apprentice shall, during this term, prove satisfactory, and shall, before the expiration thereof, execute, together with his father or guardian,—or if he have no father or guardian, then with some other responsible party,—an agreement in the form hereto annexed, then his apprenticeship shall date from the beginning of the term of trial and shall continue for the full term, unless sooner terminated as hereinafter stated.

Apprentices will be required to serve for the term of three years,—each year to consist of two thousand nine hundred and fifty (2,950) working hours, which, with the usual working day of ten hours each, is equal to two hundred and ninety-five (295) working days. The remaining working days in each year will be allowed apprentices for recreation, at such time or times as the company shall direct.

Apprentices will be required to perform their duties with punctuality, diligence and fidelity, and to conform to the rules and regulations which are or may be adopted for the government of the shops.

Apprentices will not be allowed to use tobacco in the shops during working hours.

Apprentices will be required to make up lost time at the expiration of each year, at the rate of wages paid during said year; and no year of service shall commence until the apprentice shall have fully made up all time lost in the preceding year.

The company reserves the right, whenever the state of business demands it, to shorten the hours of labor, or whenever for any reason it shall stop the works, to suspend apprentices wholly or in part; and the making up of

time so lost shall be at the discretion of the company.

The company also reserves the right, in its sole discretion, to terminate its agreement with any apprentice, and also to discharge him from its employment for non-conformity with its rules and regulations, want of industry or capacity, indifference to his duties or improper conduct within or without the shops.

Apprentices will be paid for each hour of actual service (not including time allowed for recreation or time when work is suspended) the following wages: For the first year, twelve cents; for the second year, fifteen cents, and for the third year, eighteen cents. If the company shall terminate the apprenticeship during the time of trial, it will pay at the rate of twelve cents per hour for the time worked.

Wages will be paid on the regular pay-days of the company, as they may be established from time to time.

The company will faithfully instruct the apprentice in the core-maker's art and trade, in its foundry, during the term of apprenticeship.

Agreement made this ..... day of ..... A. D. 19.., between the Brown & Sharpe Manufacturing Company, a corporation established in the city of Providence, in the state of Rhode Island, party of the first part; ..... of ....., party of the second part; and ..... of ....., party of the third part.

Whereas the party of the second part is desirous of becoming an apprentice to the party of the first part, for the purpose of acquiring the art or trade of core-maker.

Now this Agreement Witnesseth:

That the party of the first part, in consideration of the covenants herein contained on the part of the party of the third part, hereby accepts the party of the second part as an apprentice in the art or trade of core-maker, subject to and in accordance with the "Terms of Apprenticeship" which are hereto annexed and made part hereof.

The party of the second part, in consideration of such acceptance, hereby agrees to become the apprentice of the party of the first part in the core-maker's art or trade, in accordance with the said "Terms of Apprenticeship," and to faithfully conform to the provisions thereof.

The party of the third part, in consideration of the covenants on the part of the party of the first part herein contained, covenants with the party of the first part that he will pay the party of the first part as compensation for receiving the party of the second part as an apprentice the sum of forty dollars ($40); provided, however, if the party of the third part shall be unable to pay said sum of forty dollars ($40), then the party of the second part hereby agrees that the party of the first part may retain from the wages due him under this agreement the sum of one dollar ($1) per week for the first forty (40) weeks of his apprenticeship in lieu of said forty dollars ($40) to be paid by said party of the third part.

The party of the third part, for himself, his heirs, executors and administrators, covenants and agrees, to and with the party of the first part, that the party of the second part shall well and truly conform to and abide by all the terms and provisions of this agreement on his part to be kept and performed.

The party of the first part covenants and agrees, in case the party of the second part shall serve the full term of said apprenticeship (including the making up of lost time), as provided in said "Terms of Apprenticeship," and shall in all respects comply with the provisions of this agreement, to pay to the party of the second part, at the termination of said term of apprenticeship, in consideration of such faithful service, the sum of one hundred and forty dollars ($140).

In witness whereof, the parties hereto have hereunto set their hands and seals, the party of the first part by ..... its ..... duly authorized for that purpose, the day and year first above written.

In presence of

.....

.....

.....

The American Skein & Foundry Co., of Racine, Wis., has elected the following officers: President, J. F. Davidson, Racine; vice president, Geo. W. L. Laughman, South Bend, Ind.; secretary and manager of the Columbus plant, Frank E. Stoneman; treasurer and general sales agent, W. B. Mitchell, Chicago; directors, James K. Jones, J. G. Johnson, J. F. Davidson, G. W. Laughman, Mr. Schell, W. B. Mitchell, C. W. Hawes, J. F. Hess.

The Buckeye Engine & Foundry Co., Joliet, Ill., has been incorporated with a capital of $50,000. The company will deal in gas and gasoline engines, machines and manufacturers' tools. The stockholders are: Fred Bennitt, Peter Michels, George J. Buckeye, Jacob Buerlein and James A. Raymond

MOLDING IN CORES.

BY H. J. M'CASLIN.

In many cases, and especially in the case of steel castings usually, better results can be ob-

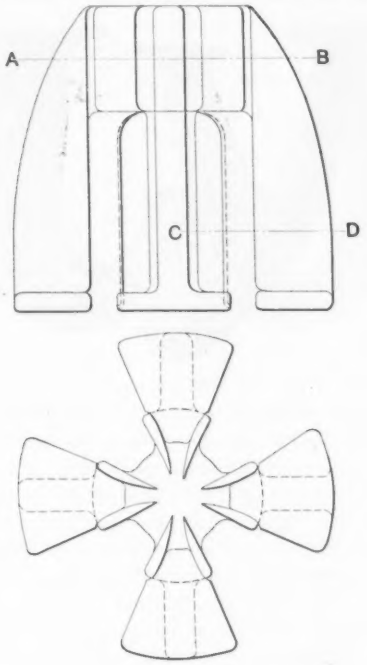


Fig. 1

tained from a dry sand mold, and frequently this can be obtained more easily and economically by making suitable core boxes and forming the mold of cores. Fig. 1 shows a required casting 10 inches in length which would be rather difficult to mold from an ordinary pattern without an exceedingly complicated mold. Fig. 2 shows a plan of the core box and a section of the pattern on the line A-B, Fig. 1. Fig. 3 shows the manner in which different parts of the pattern are set together. The pattern is made in five parts, as indicated by the letters V, W, X, Y and Z.

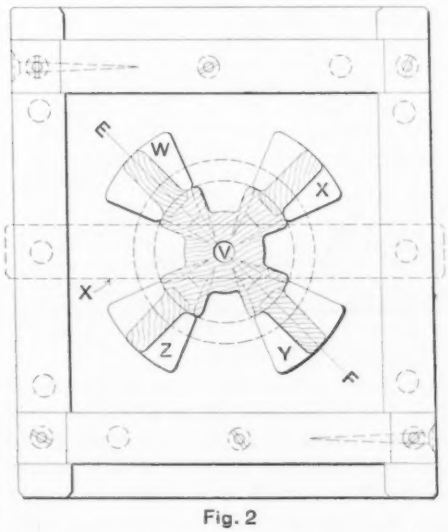


Fig. 2

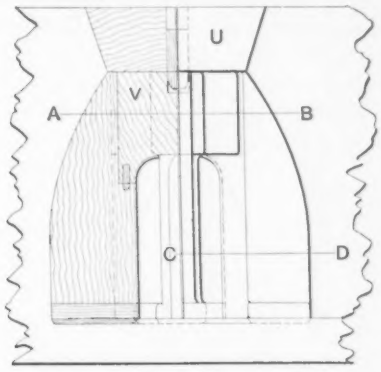


Fig. 3

In Fig. 3 the pattern is shown half in section and half in elevation, so as to show the manner of parting the different pieces of the pattern. The half section is taken on the line

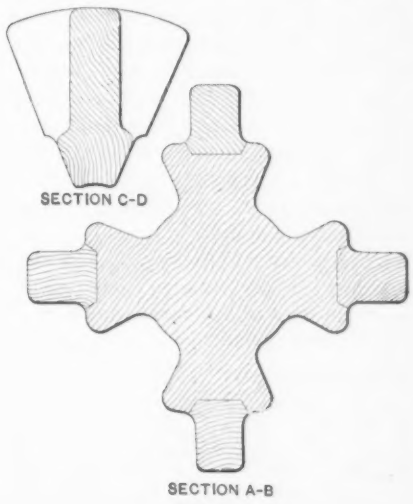


Fig. 4

E-F, Fig 2. It will be noticed that the pattern is set in to the bottom board holding the parts in position. The core box is made deep enough to allow a sufficient amount of sand above the pattern, and the core print U is placed upon the pattern as shown in Fig. 3. The height of the core print is equal to the amount of sand allowed above the pattern and

the diameter of the small end should be large enough to allow the part V of the pattern to be drawn with the print. In making a core the pattern is placed in the core box, rammed up and struck off. The core print U and portion of the pattern V are then drawn, after which the core box is rolled over and the parts W. X, Y, and Z drawn from the other side. Fig. 4 shows sections of the pattern on the lines A-B and C-D. A block the form of

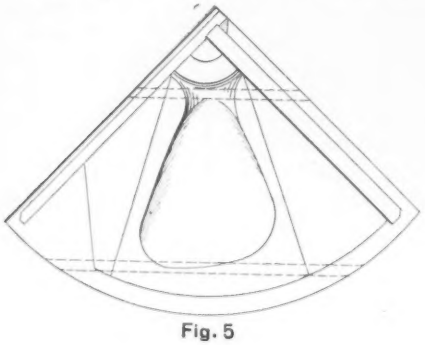


Fig. 5

the core with a depression corresponding to the core print V, not shown, is used as a pattern to make a mold to receive the core, the mold being gated through the portion of the cope fitting the space U. When a great number of castings are required a box can be made large enough to receive a number of these cores, and rammed up with depressions in drag. A runner can be rammed up in the center one in place of one of the patterns and the surrounding ones gated from this. This manner of coring will be found very convenient in small steel castings where a dry sand mold is desired.

Small propeller wheels may also be molded in cores, either dry sand or green sand, by using a core box of the form shown in Figs. 5 and 6. One advantage of this method is

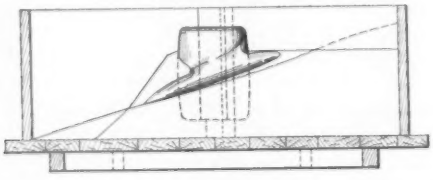


Fig. 6

that it assures the fact that the blades are as nearly alike as it is possible to make them, which is important. Usually in molding a pattern of this description a follow board is used, while that part of the core box containing the back of the blade is rammed up. The face of the follow board can be developed and built as a propeller blade, as explained in the March issue of *The Patternmaker*. As a blade contains but a small portion of the area of the surface of the box, it is not necessary

FIG. 7.

to make a follow board the full dimensions of the size of the box, but just wide enough to form a joint all around the blade. The remaining portion of the surface can be cut away to any convenient angle, as shown in Fig. 6. By building the follow board first, so that its face represents a portion of the face of the blade it can be used in building and laying off the pattern, the pattern being built by gluing strips together and working off back to the

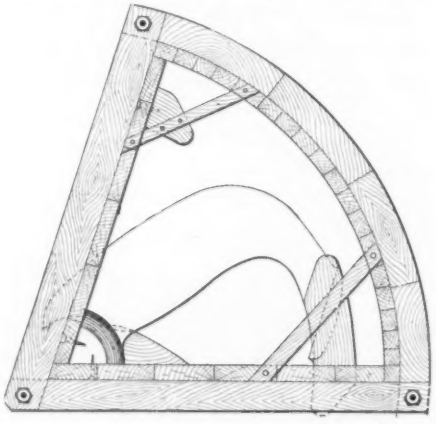


Fig. 8

proper form. If the pattern is made first, the follow board can be made of plaster of paris, the pattern being used to give it the proper shape. In molding patterns of this description by this method, iron skeletons or core irons with suitable lifters must be provided for both parts of the mold for lifting out the core. Plaster being used for very small wheels only.

When making a mold, the top part of the core box containing the back of the blade is rammed up first with a core iron or skeleton properly placed, the core box is then rolled over, the follow board removed, the parting prepared and the balance of the core box rammed up with the core iron or skeleton in

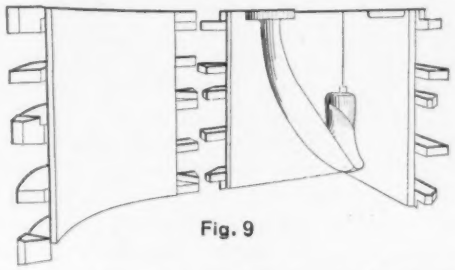


Fig. 9

place. After the ramming is completed, the core box is removed, the cope part of the mold lifted off and held suspended while the pattern is withdrawn and the mold finished. A level bed is then prepared and the drag part of the core is placed upon it and the cope part on top of the drag portion. These operations are repeated for each of the succeeding blades thus forming a complete circle. Of course in the case of dry sand cores they must be baked before they are placed upon the bed. After the cores are placed in position upon the bed an open flask or box or a metal curbing is placed around them and the space between the cores and the box or curbing rammed with

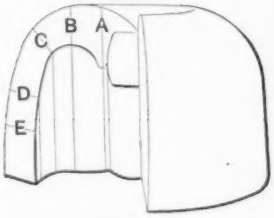


Fig. 10

sand to form a backing. The cores must also be weighted down.

A large steel casting weighing 8,000 pounds made by the Wellman-Seaver-Morgan Co., is shown in Fig. 7. This is a cutter head used on a large centrifugal dredge. From the form it will be seen that this would be a rather difficult piece to produce in an ordinary green sand or dry sand mold. But by molding in cores in a manner similar to that used for small propeller wheels, the work was accomplished with ease. Fig. 8 shows a top view of the core box, with the pattern for one of the five arms in place. Fig. 9 shows the core box with the front removed and shown at the left. The pattern is shown in place in the portion of box on the right. In molding one section of this mold in the core box, that portion of the core which contained the back of the blade was rammed first, the core iron or lifting plate be-

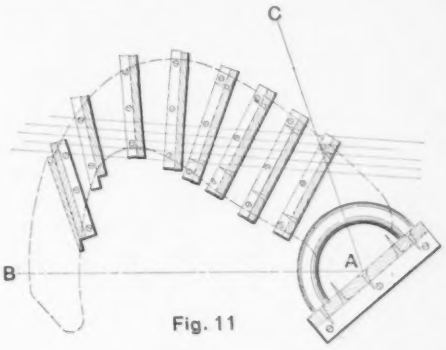


Fig. 11

ing placed near the bottom of the box. A parting was made along the edge of the blade as the ramming progressed. This parting was then covered with parting sand, a lifting iron introduced for the upper portion of the core and the upper portion rammed. The front of the box was then removed and the sides drawn back, leaving the core free. The top or cope part was then lifted off and held suspended while the pattern was drawn and the mold finished. It was then placed back

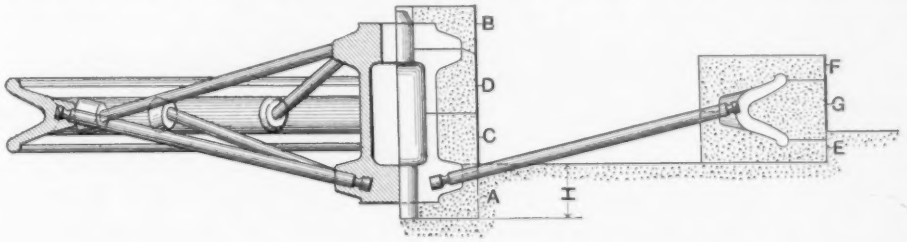


Fig. 12

in position and the whole core shoved into the oven to be dried. For convenience the core was made upon a car so that it did not have to be removed from the car to introduce it into the oven. After the five sections were completed, a pit was dug, a level bed swept up,

the sections placed together, provision made for suitable gating and for sinking heads. The whole was then backed up with sand thoroughly rammed. The pattern for this job was made as follows: owing to the angular form of the blade it was impossible to lay it out from

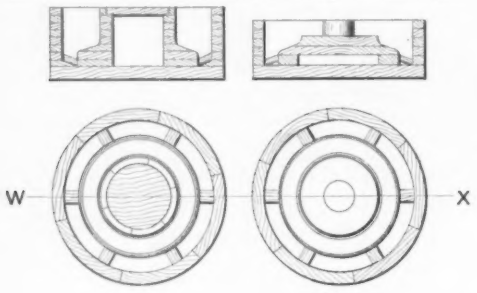


Fig. 14 Fig. 13

the drawing in a reliable manner and hence a block or model was turned to scale, as shown in Fig. 10. The diameter and form of this block corresponded with that of the cutting edge except that it was made to a smaller scale. The outline of the cutting edge was then laid off on this block and the material cut away so as to give the sections A, B. C, D, and E. The whole sur-

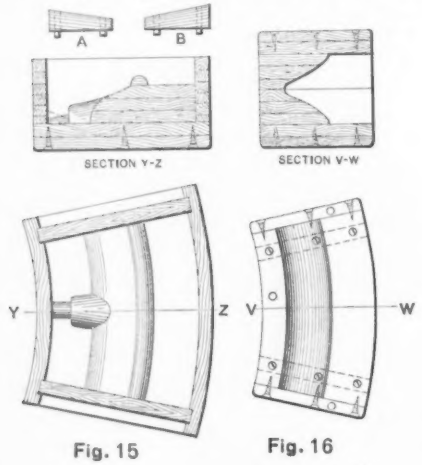


Fig. 15 Fig. 16

face between these sections was cut away to represent the under side of the blade. The width of these sections was laid off and these points connected with a flexible rule or strip and this line was sawed perpendicular to the base, giving the inner outline of the blade. This outline was then transferred full size to the building board and perpendicular supports erected as shown in Fig. 11, these supports conforming with the angle of the blade at the points A, B, C, D, and E, Fig. 10. A half hub was made and secured in its correct position. The portions of the hub outside of the lines A-B and A-C Fig. 11 were afterwards cut away to fit the core box. The pattern was built by fitting pieces over supports as shown by the parallel dotted lines in Fig. 11. These being glued together and to the hub, and the back worked off. The pattern was subsequently parted on the lines A-B and A-C and the portions of the pattern which fell outside of these lines were secured to opposite sides of the core box, as shown in Figs. 8 and 9.

A method of molding rope sheaves having wrought iron arms which are staggered in the hub is illustrated in Fig. 12 the left hand portion of the figure showing a section of the wheel and the right hand portion the

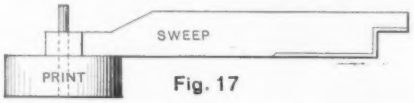


Fig. 17

method of making the mold. The core boxes for making the cores A and B for the upper and lower portions of the hub and the middle portions C and D are shown in Figs. 13 and 14 the boxes being shown in plan in the lower portion of the figures, and in section in the upper portion. These cores form the mold for the outside of the hub. An ordinary cylindrical core formed in a regular core box is used for the bore of the hub. In Figs. 15 and 16 are shown the core boxes for forming top and bottom rim cores E and F

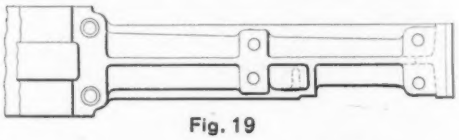


Fig. 19

and the groove core C. At A-B Fig. 15, are shown two core prints used in the rim core box as shown in the section on the line Y-Z for forming the openings for the introduction of the wrought iron rods. It is necessary to change these prints for the top and bottom cores E and F. owing to the fact that the rods enter the rim at an angle and that this angle alternates with each succeeding spoke.

In making this kind of a mold, a level bed is struck up and the block or print bedded in to receive and set the hub core. The height of this is equal to H, as shown in Fig. 12. To a pin or spindle in the center a sweep is attached as shown in Fig. 17. This sweep is used for forming the bed which is to receive the rim cores E and the groove cores G. Af-

ter this has been accomplished the lower section of the hub core A and the rim cores E are set, then the rods which enter the core A are placed in position the groove core G is set and the middle section hub cores C and D. Then the rods which enter the upper portion

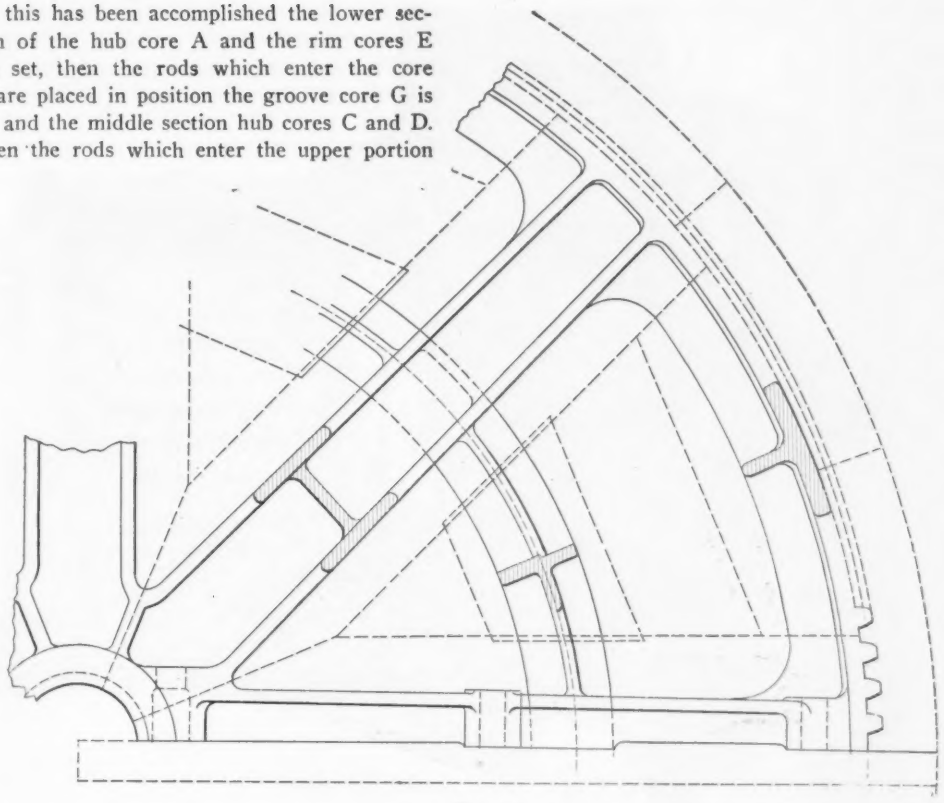


Fig. 18

of the core are placed in position and the upper portion of the hub core B and the rim cores F placed in position. The hub cores C and D should be carefully pasted together, so that the upper and lower prints to receive the rods will come exactly between each other.

One method of molding a large gear in cores is shown in Figs. 18 and 19. This method was applied to a cast steel split gear 15 feet, 6 inches in diameter, 4 inch circular pitch, 144 teeth, and 16½ inch face, with a T section flange cast on one side and joined to

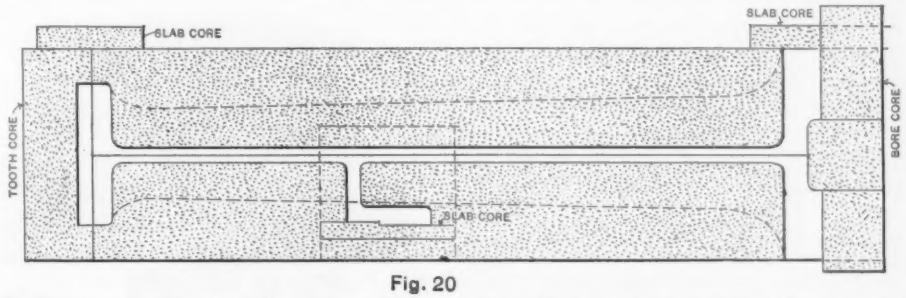


Fig. 20

The bore core is set before the top core B is placed in position. After all the cores are in position, the mold is rammed up with green sand and weighted. In pouring a wheel of this description the rim is usually poured and allowed to cool before the hub is poured, as this lessens the strain caused by contraction and produces a sounder and better wheel.

arms about midway between the hub and the rim. The entire gear weighed 26,000 pounds. A drawing of a portion of the gear is shown in Fig. 18 a section of the rim, of the T flange and the arm being shown. The dotted lines in Fig. 18 show the arrangement of the different cores which were used in forming the mold. In Fig. 19 a half elevation of the bolt-

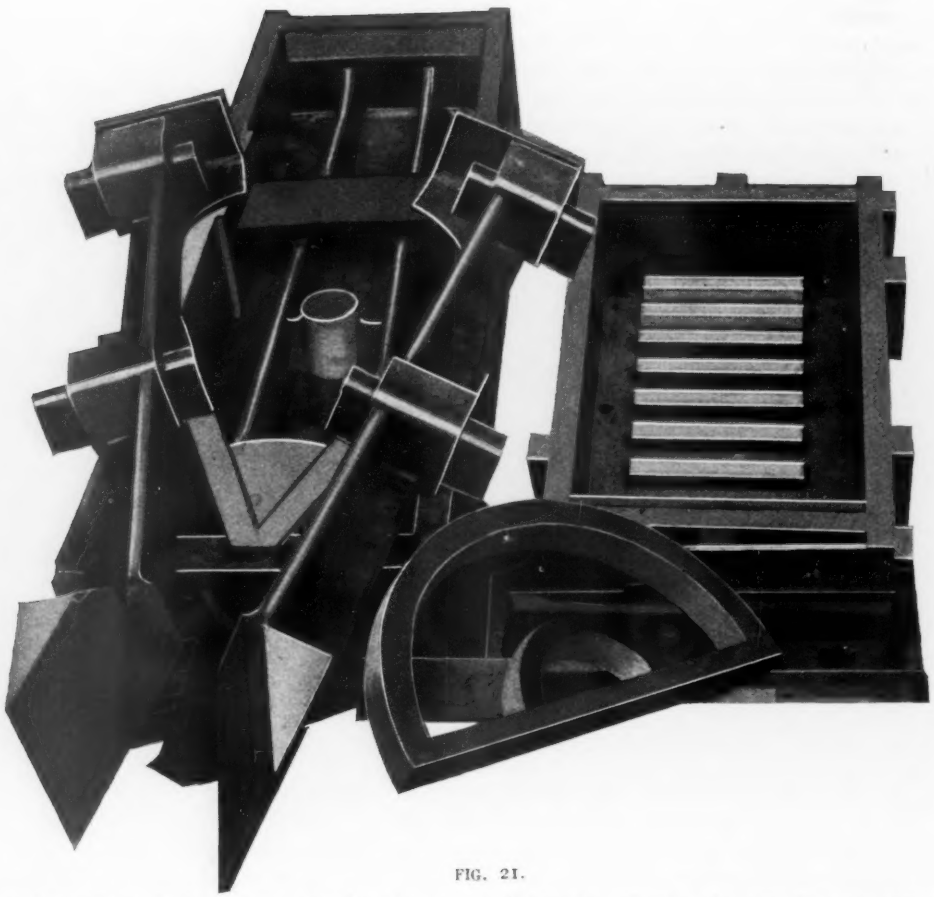


FIG. 21.

ing face of the gear is given, showing the location of the bolt holes, which were cored, the construction of the hub, etc. A section of the mold through the center of one

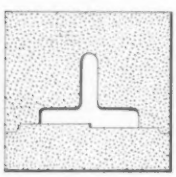


Fig. 22

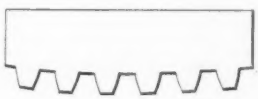


Fig. 25

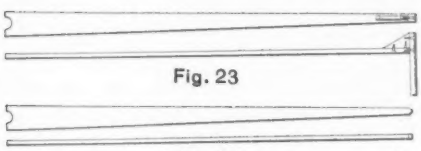


Fig. 23

Fig. 24

of the arms is shown in Fig. 20. It will be noticed that a slab core is used for covering the joint at the hub, and also under the portion of the T flange opposite the arm. In making the core for the arm it was rammed level with the T flange, the face portion then drawn and the slab core placed over it, after which the box was rammed full. The arm

FIG. 26.

core box was used for the upper and lower halves of the arm cores, the flange portion of the pattern being removed for the upper half of the core. The same box was also used for the half arm cores on the bolting line, a half

arm with pads and core prints being used in the box as shown in Fig. 21. In this case part of the box was stopped off longitudinally by dropping in a board. The manner in which the cores for the portion of the T section flange between the arms were joined together is shown in Fig. 22. In beginning the mold

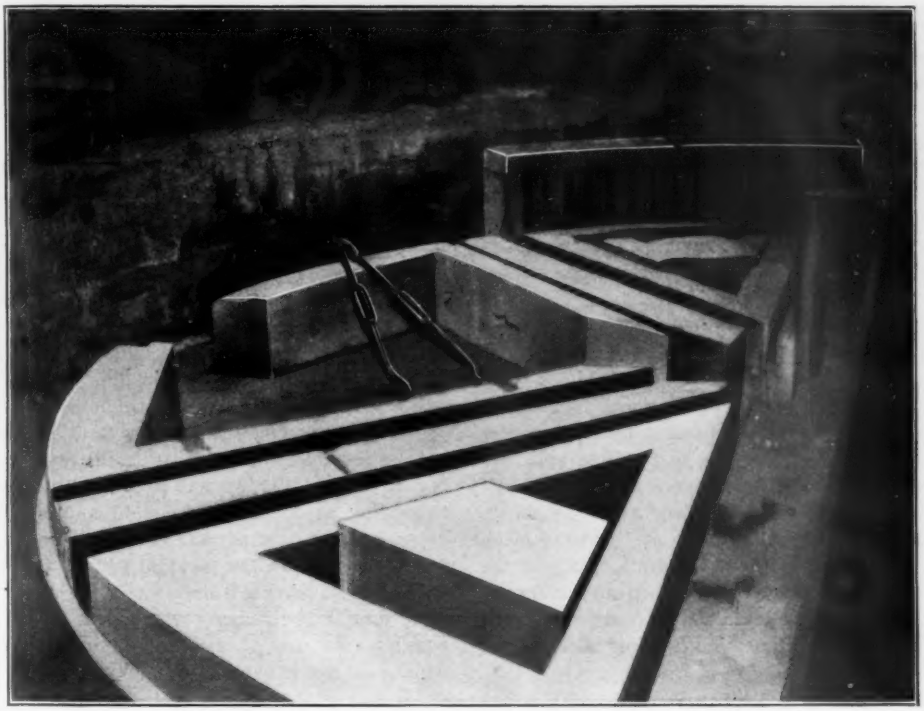


FIG. 27.

a pit was dug as deep as the cores were high, and a level bed struck-off. With the aid of a spindle and the gauge sticks shown in Fig. 23 the arm and rim cores were set. The gauge stick shown in Fig. 24 and the templet of teeth shown in Fig. 25 were used for setting the teeth cores. The templet being used at the joints to see that the cores matched properly.

A photograph of the mold taken during the setting of the cores is shown in Fig. 27. After the cores were all in place the space between as well as that between the walls of the pit and the tooth cores was rammed with sand. In Fig. 26 is shown a photograph of some of the special core boxes used, which, together with the core boxes shown in Fig. 21 made all of the cores necessary for the different parts of the mold.

DOES IRON EXPAND?

BY H. SAYERS.

Under the above heading, in the June number, Mr. Webb takes exception to some so-called theories (by the way, what is a *so-called* theory ?) expressed in an article of mine on "Green Sand Bottoms and Sound Castings." I have no objection to criticisms, and am open to conviction, but I wish that Mr. Webb had read the article more carefully before he criticised. I do not draw the conclusion that iron expands from the oozing out of iron, through the risers, of a mold containing cores. If he will read it again he will find that I wrote,—"it is undisputed that the cores in a mold swell for some little time after being surrounded by metal," etc. I draw the conclusion that iron expands, among other reasons, from the fact that solid iron floats in liquid iron, and I used the swelling of the cores to prove that it was the mold expanding that caused the trouble; otherwise the slight expanding of both cores and iron should insure a solid casting. He offers the solid chill round the rim of a car wheel as a nonexpansive mold. Surely Mr. Webb must know that iron is susceptible to the effects of heat as anything he

could use in a mold. If he does not know, let him take his chill, or a lighter ring representing it, and carefully measure it, as say, 60 degrees, then warm it up to about 600 degrees, and measure again. He will find a very considerable expansion, which continues, I believe, up to the melting point, when it begins to contract, such contraction increasing as the fluid gets hotter.

When a car wheel is cast, the metal touching the rim is instantly cooled and expanded, thereby occupying more room in the mold and preventing the entrance of more metal. I did not say that a large casting would not contract as much as a small one, nor a loam casting as much as one in green sand; what I did write was, that a heavy green sand casting would not show anything like the contraction allowed for by the patternmakers' rule on account of the mold expansion. He says that the block mentioned must have been poured very dull, or else had a shrink hole somewhere else. Had it been poured very dull, the hole would have shown up as sure as fate. If Mr. Webb is casting heavy pieces with cores in, which are to machine and bore out sound, he will not have much success if he pours them very dull; and as to the shrink hole being somewhere else, if I have a block in green sand with a dry sand core and the shrink hole does not show up near the core, I am willing to stake dollars to cents every time that there is not one, and be a bit in pocket on the betting.

My contention is that feeding troubles are caused by the expansion of the mold and not by the sinking of the iron and how small an expansion will cause trouble we can readily see; consider the case of a casting of 100 square inches surface, quite a small one, but if the walls expand even the hundredth part of an inch, supposing the iron not to expand, we shall have a shrink hole a cubic inch in capacity. The theory that iron expands in cooling down to settling point is supported by the following facts: 1st, a piece of solid iron will float on the surface of a ladle of hot iron, thereby showing that it is lighter when set than in a fluid condition, which could not be the case if it shrunk or sunk in setting. 2d, it is good practice to place a chill against a heavy section, when the latter cannot be reached by a feeder, the chill being generally effective in producing a solid job; if the iron shrinks, how could the chill prevent it? The only effect would be to hasten the shrinkage. The fact is, the chill sets the metal before the mold expansion has practically commenced. 3d, we can procure a sounder casting in dry sand or loam, with much less trouble of feeding than in green sand, while the reverse would be the case were it the sinking of the iron which caused the trouble, as the walls of the green mold should to an extent chill and hasten the shrinkage. 4th, we get a much sounder job by casting as hot as possible, i. e., while the iron is in the state of greatest concentration and has most expansion with which to follow up the expanding mold. The chief point that tells against the theory is the contraction, as it would appear that if the iron in the ladle is heavier, bulk for bulk, than cold iron, there should be no contraction. This is a difficult point, I admit, but it is probable that the iron in flowing into the mold is chilling and expanding and taking up more room than when in the ladle to the exclusion of more iron, and by the time the mold is full there is little further expansion to take place, and the chances are that the surplus caused by this expansion will find its way through the runners and risers, as it is common knowledge that nothing can be fed into a heavy casting till the metal becomes pasty, that is, has parted with all its expanding power, while the mold continues to expand as the heat penetrates further into the walls, the iron on the point of setting following it up and leaving a hole where the metal is most fluid. The remedy will appear to be, if possible, the use of sand or other material which will not expand.

SPECIFICATIONS—AND WHAT THEY MEAN TO THE FOUNDRYMAN.*

BY DAVID REID, COLUMBUS, O.

For the many years past the foundry had had the notoriety in the mechanical world of not being able to conform closely to definite requirements of strength in the product turned out. Engineers and designers had to therefore make very liberal allowances in selecting their factors of safety.

Competition and the advance of knowledge is compelling us to discard the old rule-of-thumb methods, and look more closely into the ways by which given requirements may be fulfilled. Specifications, the things that are always seen in other industries, are now becoming more strongly pushed in ours, too fast perhaps for some of us, but nevertheless they are coming and will stay.

*Paper read at A. F. A. Convention, Indianapolis, June, 1904.

The average foundryman makes his first and greatest mistake when given drawings and specifications to figure on, by simply glancing over those specifications, tossing them into the corner, and then devoting hours and days in scheming how high to make his price, and how low to cut the costs, so that the job may be secured and yet be profitable. If the terms of the specifications define the material as Cast Iron No. 1 with a tensile strength of 23,000 per sq. in.; or No. 2, to be nigh grade Cast Iron or Gun Iron, to be made of charcoal metal, in the air furnace, or other process giving a product with a tensile strength of not less than 28,000 lbs. per sq. in., with an elongation of 0.25 percent before rupture, while under strain. If he has these things to meet, he often passes them from his mind with the feeling that good commercial work will cover this all right, takes the contract, only to have his eyes opened, and his credit and bank account impaired, on account of his inability to carry out the specifications as agreed.

The writer has nad a number of instances of this kind drawn to his attention during the last six months, and is presenting this matter with the idea of showing that specifications are being constantly drawn up, not for the purpose only of getting good commercial products, but to obtain something far superior to every day castings.

The specifications for the No. 2 cast iron mentioned above, which are those of the Ordnance Department, have been recently made more stringent for a special contract I was engaged upon, and are as follows:

Material to contain Silicon 1.25 to 1.35, Sulphur not over 0.12, Phosphorus not over 0.45, Manganese 0.65 to 0.75. The tensile strength 30,000 to 35,000 per sq. in. Elongation before rupture 0.25 per cent.

To the credit of the American Foundrymen's Association, and the Cast Iron Committee of the American Society for Testing Materials, be it said that we were in position to carry out such severe specifications, for their investigations have enabled us to specify in turn our pig irons in such a way that the furnaces could furnish just what was wanted.

The two classes of cast iron mentioned above, while very similar as to strength, differ in that in the first case they call for charcoal iron melted in the air furnace, or a similar process giving the required elongation; and in the second, the mixture of cast iron and steel scrap, erroneously called semi-steel, is directly specified. Foundries heretofore making this No. 2 iron have always gotten the required strength by the use of steel scrap additions, but the general orders of last November, from the Ordnance Department prohibited the making of this material, and compels the foundryman to stick to pig iron and scrap.

If great care is used this specification can be met, whether the air furnace or the cupola is used. I have had results which averaged 30,000 lbs. with greater elongation than required, by using charcoal irons with silicon 1.10 sulphur 0.065 to 0.075, phosphorus 0.30, manganese 1.15, and the total carbon from 3.00 to 3.50. The best scrap was used, and ran about 1.65 in silicon.

In the so-called semi-steel specifications we used a Southern iron in connection with the charcoal iron, and 40 per cent of clean steel scrap. The results were highly satisfactory.

While these cases are no doubt special, and high grade material is required, they re-call the words of Dr. Dudley, in his address on "The Making of Specifications," delivered before the American Society for Testing Materials last year. He speaks of the fault characteristic of many specifications, being the effort on the part of the one drawing them up to make it a place to show how much he knows, putting in too many restrictions, and making the document too severe.

While heartily in favor of, and preferring to work to specifications, the writer believes that the foundry industry has not yet reached the point, where engineers can give full sway to their knowledge and imagination, too often the latter, in drawing up specifications for castings. The efforts of the American Society for Testing Materials, of which this Association is a component part, to make their specifications for pig iron, cast iron, and a variety of classes of finished castings, the standard for the whole world, is therefore to be commended and should have the full support of every member of our Association.

The Dorchester Agricultural Works, Dorchester, S. C., has been incorporated with a capital of $2,000 to manufacture plows and other farming implements. W. S. Lining is president, and I. M. Williams, vice president, secretary and treasurer.

The recent fire in the plant of the Locke Regulator Co., Salem, Mass., destroyed the brass and iron foundries, but did not destroy the main works and will not delay the company to any great extent in filling orders.

FOUNDRY CASTING ACCOUNTS.

BY J. DAVIDSON.

The "Order and Production Sheet," Form 1, is made out in the drafting room and serves as an order on the foundry. As soon as an order sheet is received at the foundry, the order clerk fills out a "Foundry Job Card," Form 2, for each item on the order and files it according to the dates the castings are to be completed.

When a pattern is received from the pattern shop, and is ready to go on to the floor, the job

PENN CAR AND FOUNDRY CO. ORDER AND PRODUCTION SHEET — ORDER No. 379

MOULDERS NUMBER		29			MACH.I			MACH.I			46			50			23			16			10			50 D.T. COAL			
PART		BRAKE HAND WHEEL			BRAKE SHAFT BEARING			BRAKE SHAFT RACHET			BOLSTER GUIDE			BOLSTER GUIDE			SIDE BEARING			SPRING SEATS			TRUSS PLATE			TOTAL WEIGHT OF CASTINGS CHARGED TO ORDER	TOTAL WEIGHT OF CASTINGS FOUND DEFECTIVE IN MACHINE SHOP	TOTAL WEIGHT OF CASTINGS SPOILED IN MACHINE SHOP	TOTAL WEIGHT OF CASTINGS
PATTERN NO.		B-177			B-93			B-94			T-330			T-334			T-57			T-44			T-100						
PATTERN DUE		2-8			2-8			2-8			2-4			2-4			2-4			2-4			2-4						
PATTERN REC'D		1-30			1-30			1-30			1-26			1-26			1-26			1-25			1-16						
ORDER TO BE COMPLETED		2-29			2-29			2-29			2-29			2-29			2-29			2-29			2-29						
TOTAL NO. WANTED		50			50			50			200			200			200			200			200						
NUMBER MOULDED		DAILY	TOTAL	WEIGHT	DAILY	TOTAL	WEIGHT	DAILY	TOTAL	WEIGHT	DAILY	TOTAL	WEIGHT	DAILY	TOTAL	WEIGHT	DAILY	TOTAL	WEIGHT	DAILY	TOTAL	WEIGHT	DAILY	TOTAL	WEIGHT		R	D	
Feb 1904	1										12	12	960	12	12	965	20	20	440	15	15	730	12	12	1104	4199			
	2										12	24	975	12	23	880	18	38	400	17	30	725	12	23	1012	3992			
	3										14	38	1095	12	33	805	19	56	396	15	45	735	12	35	1100	4131			
	4										12	47	890	10	43	800	20	74	400	16	61	780	14	47	1090	3960			
	5										12	59	960	10	53	815	20	94	445	18	78	830	12	59	1106	4156			
	6										12	71	970	12	64	885	20	113	420	15	93	730	12	70	1005	4010			
	8	10	10	180							14	83	975	12	76	970	20	131	390	15	106	640	14	84	1288	4443			
	9	10	20	180							10	93	795	14	90	1120	10	141	225	16	122	775	12	96	1106	4201			
	10	8	28	144	25	20	100	30	30	150	12	105	960	10	100	880				16	138	780	12	108	1104	4118			
	11	10	36	144	25	45	125	20	50	100	12	117	970	12	112	960	16	156	330	18	154	775	12	119	1002	4406			
	12	6	42	108							14	130	1040	12	124	975	20	176	445	15	169	725	10	129	925	4218			
	13	8	50	144							14	144	1150	12	136	890	18	192	355	15	184	725	12	141	1104	4368			
	15										12	155	875	14	148	1045	8	200	176	18	200	775	12	153	1100	3971			
	16										14	169	1160	12	160	970							12	164	1000	3130			
	17										12	181	970	14	174	1150	D2			D2			14	178	1790	3410			
	18										10	191	800	14	188	1140	D3						12	190	1106	3046			
	19	D2									9	199	640	12	200	960							10	200	930	2530			
	20										D4			R2						2	2	D 90							90	
	22										1	200	82										R1			82			
	23													2	2	R 160											160		
	24	2	2	D 36							R2						5	5	D 115				1	1	R 95		95	151	
	25										6	6	R 165 D 330														165	330	
	26																												
	27																												
	29																												
				900			225			250			16267			16210			4422			9725			18372	66371			
				D 36									D 330						D 115			D 90						571	
													R 165			R 160									R 95		420		
													Form 1																

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card for that pattern is taken from the file and given to the molder with the pattern. After the day's cast, the molder enters on the job card the date, and the number of castings made, and turns the card into the office, where the production clerk credits the number of castings made up to the order.

After the job cards have been entered on the production sheet, they are copied on the "daily record of castings made," Form 3, after which all cards that have not been completed are returned to the molder, and those that are completed are filed away for future reference.

The daily report of castings made is sent to the cleaning room, where the inspector checks each item, entering in the proper columns the number broken, the number bad, the total defective and total good.

The weighmaster weighs all castings and enters the weight on the daily report of castings made. After the castings have passed the inspector and have been weighed, they are shipped to the several shops on small cars—one car for each shop. A bill of lading in duplicate is sent with each car. The shop receiving the car checks off the castings, signs the duplicate bill, and returns it to the foundry.

The number of pieces shipped, the shop number and the number of the car on which the castings are shipped are shown under "shipment" on the daily report of castings made.

After the daily report has been completed in the cleaning room, it is returned to the office where the defective castings are entered in red ink on the production sheet and deducted from the number cast, and the total good castings, to date, carried out. The weights of the good castings are entered in the weight column. The bad and broken castings are entered on the job card and deducted from the number cast. In this way the molder can see at a glance just how many castings he has to make to complete the order, and so has no excuse for making a casting over.

By the use of this system the over production, which in some foundries is very great, is almost entirely avoided.

All castings found to be defective after leaving the foundry are classed as defective in the foundry and the weight of the castings made to replace them are charged to defective castings. Castings that are spoiled in the machine shop are classed as replacements and are not charged direct to the order, but to errors on account of the shop where the errors occurred. When a casting is found to be defective after it has been received in the machine shop, or if it has been spoiled in machining, it is returned to the foundry. A replace order is also sent, giving the name of the casting, the order and pattern number, and the cause of the replacement, and shop responsible. The number of castings wanted on the replacement is entered in red ink on the production sheet under the proper heading opposite the date the replacement is received. If

Form No. 2

FOUNDRY JOB CARD

ORDER NO. 379 DATE Jan 25 1904
TO BE COMPLETED Feb 29 1904
PIECE WORK NO. 15169 PRICE PER PIECE .35
NAME OF CASTING
Bolster Guide

CARD NO.	PATTERN NO.	ACCOUNT	NO. WANTED
Z-162	T-334		200

MOULDERS NAME	DATE CAST	NO. CAST	NO. BAD	NO. BROKEN	CAST TO DATE
Brown & H	2/1	12 ✓			12
"	2	12 ✓	1		23
"	3	12 ✓	1	1	33
"	4	10 ✓			43
"	5	10 ✓			53
"	6	12 ✓	1		64
"	8	12 ✓			76
"	9	14 ✓			90
"	10	10 ✓			100
"	11	12 ✓			112
"	12	12 ✓			124
"	13	12 ✓		1	135
"	15	14 ✓		1	148
"	16	12 ✓			160
"	17	14 ✓			174
"	18	14 ✓			188
"	19	12 ✓			200
"					
"					
"					

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the replacement is the fault of the foundry it is entered R 1, or if the fault of the machine shop it is entered D 1. A foundry job card is made out for each replacement the same as for a regular order, only that in the space marked "account" the number of the shop responsible for the replacement is entered. The weights of replace castings are entered, in red ink, in the weight column, as R 36 or D 36, as the charge may be to the foundry or the machine shop.

The weights for the several items are added

daily and the totals entered in the columns at the right of the sheet. The weight charged direct to the order is the first column; that to replacements due to the foundry in the second column; and that to replacements due to the machine shop in the third. The total weight of these three items must agree with the total weight of good castings shown on the daily report. At the end of the month the weights of each item are added and the total weight of the several items must agree with the total weight of the order.

PENN CAR AND FOUNDRY CO.

DAILY REPORT OF CASTINGS MADE

W. Jones INSPECTOR DATE, Feb 2 1904

MOULDER	ORDER NO.	PATTERN NO.	NAME OF CASTING	BROKEN	BAD	TOTAL BAD	TOTAL MADE	TOTAL GOOD	WEIGHT PER PIECE	TOTAL WEIGHT	SHIPMENT		
											NO. PIECES	SHOP NUMBER	NO. OF CAR
Brown & H	379	T 324	Bolster Guide		1	1	12	11		880	11	10	C 1
	380	C 24	Washers				5	5		25	5	7	C 8
Barey W	379	T 100	Truss Plate	1		1	12	11		1012	11	10	C 1
Durkin H	379	T 330	Bolster Guide				12	12		975	12	10	C 1
Downey W	375	B 177	Brake Hand Wheel				5	5		90	5	6	Q 2
	380	B 160	Bracket		2	2	15	13		130	13	6	Q 2
Forest D	379	T 40	Spring Seat	1	1	2	17	15		725	15	6	Q 2
Guy H	389	T 49	Spring Seat				10	10		420	10	6	Q 2
	374	T 57	Side Bearing				18	18		400	18	10	C 1
			Total weight of good castings							20592			

Form 3

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Under this system the chance for errors is very small, as there is a double check on all work, from the time the order is received until the good casting is sent out.

THE PATTERN SHOP AND THE FOUNDRY.*

BY H. L. POST.

I have been called upon by your worthy president to respond to the toast, "The Relation of the Pattern Shop to the Foundry."

Now, gentlemen, this is a subject on which much may be said, as it embraces a very broad field. First, do the foremen of the two departments work together along the same lines? Are they trying to economize in both departments so as to save the firm from loss, or is each individual looking out for himself and shoving the work on the other department regardless of the cost so that by the end of the year he can make a good showing? We are all aware that at times when there is only one casting to be made from a pattern that it pays to make a cheap pattern and let the molder do a good part of the work in the foundry, which of course adds to the cost of the casting but reduces the cost of the pattern to such a degree that the time saved on the pattern would pay for twice the time spent by the molder. There are also times when it pays to have a good pattern and save the molder time. Now if the patternmaker is satisfied and tries to put all the work on the foundry, and save in his department, or the molder demands a good pattern regardless of cost to the firm there is something wrong in the relation of the pattern shop to the foundry. We should look upon the making of that pattern and casting as a business transaction, as if we were the owners of the plant, and are in business to make a profit, and then we will be doing as we should regardless of which department the cost is charged against. To show you how the average foreman patternmaker is appreciated I will read you a few verses taken from *The Iron Molder's Journal* entitled "The Patternmaker:"

The Patternmaker.

If ever you meet a self-made man
With the air of a Bursary taker,
And eyes that can pierce you through at a scan
And a voice like a frowsy Quaker—
Who carries a glaring excuse in each hand—
A straight-edge and section breaker,
Or a shrinkage rule and a blue-print plan—
That's the foreman patternmaker.

If still you're unable to focus him, mate,
He has other traits—and greater:
He is always willing to give and take
So long as he acts as dictator.
He's a very good judge of a foundry fake,
And a splendid procrastinator,
And finally he—now make no mistake—
Is a shavings masticator.

*Paper read before the Erie Foundry Foremen, March 19, 1904.

When you have the slightest doubt of a size,
His trammels 'll quickly fix it.
If a casting is too much avoirdupois—
Take all sorts of care that you mix it,
Or else prepare for a thundering noise
Before the time comes for his exit;
It's no use you blaming the "Blankety" boys,
For he'll still say things, *ipse dixit.*

Whenever you feel the need of a friend
Just slip down and tell him what's what,
He'll advise you when you should cast upon end,
And also when you should not.
He'll show you the way to part a quick bend
That's fixed, like a dog on a rat,
But should you unbend to enlighten *him,* friend,
You'll get your answer pat.

His arrival here in the foundry yard
Is always the source of conjecture:
Will he ask for the core-box for that guard?
Or the frame of that sunbeam reflector?
If you notice him come with face set hard,
"The old man's" booked for a lecture;
If not, most likely he'll speak by the card,
And pass some remarks on the "fracture."

His methods of molding a job would hoodwink
Sherlock Holmes or a puzzle connector,
And a stranger might have good reason to think
He was Principal Casting Inspector.
He fossicks around with blue pencil and ink
Like a tentative bad debt collector—
But the foundrymen know him by—"Hover a blink,"
"Here's the foundry Mistake Corrector."

COLD SHOT.

Now, gentlemen, this does not show the proper spirit. I would not care to consult with a foreman-molder who had such an opinion. What would be the use of my taking the trouble if the patternmaker is the foundry mistake-corrector? No, gentlemen, he is the man who is doing his best to help the foundry foreman and molders if they will only try to look at it in that way and show him that they appreciate his efforts. I am sure it is my desire, and should be of every patternmaker foreman, to make the patterns mold with the least possible trouble to the molder and lowest cost to the firm, taking care, of course, to make first class durable patterns for standard work, when patterns are continually in the foundry and subject to hard usage.

Now, in order to do this, I have made molding a continual study and so should each and every foreman. Never let up or you will soon be a back number. You may ask, how can a patternmaker study molding and not work at it with his hands as I do? The pattern foreman has the same opportunity that the foundry foreman has. He is with the molders day after day, sees all their troubles, and is anxious to have a first class reputation as a patternmaker. If the pattern gives the molder trouble he finds out why and does his best to make it so that it will work all right the next time and in that way, if he is a competent man, he will become a first class molder theoretically. He stands in the same position to the foundry that the engineer does, who builds bridges, or the architect who constructs houses. He does the planning to the best of his ability and the men do the work, and as years pass by and he is in constant contact with the work he plans, he becomes a first class engineer, and as engineers are made so are foremen and workmen, by constant study along the line of their chosen vocation in life.

To show you how the patternmaker is blamed at times when he should not be, I will give you an illustration. Some four years ago one of our cylinder makers was making a mold for one of our high speed automatic engine steam chests and it is one of those pieces which the average molder does not care to handle. I happened to have some business with the foreman coremaker, and in passing through the foundry this molder said to me, "This is not the way to make this steam chest pattern. It could have been made to mold in an easier way than this if whoever made it had half tried." I said to this man, "You are just the fellow I have been looking for. I would like to know how to mold that steam chest in some easier way. I have studied over that chest for two or three days trying to find the best method and if you can show me a better way I shall be pleased to acknowledge it." Well, the result was that he had found fault without having the slightest idea himself how he could better it. He studied over it while I attended to my business in the core room and when I came back he acknowledged that he had to give it up. I then told him to please not kick the poor patternmaker before you are sure you can better the job he has made for you. Give him a chance and it will be better for all parties and create a better sentiment among the men in both departments.

My son is running a job pattern shop and there is no question but that if he only knew

the foreman molder of the foundry where the patterns were going to be sent, he would prefer making them to suit that foreman, but how does he know who is going to mold those patterns? They go to all parts of the country and as you can easily see the foreman patternmaker is compelled to be the molder. All he gets from his customers are the blue prints and the order to make the patterns and the job shop foreman is compelled to do the rest, and if he fails to make a good job—well I won't mention what the molders have to say about him, but I will say that the relations between the pattern shop and the foundry become very strained; therefore the foreman molder and men should help the patternmaker to gain all the knowledge possible in the art of drawing patterns from the sand and they will find the patternmaker will meet them half way and it will improve the methods of all concerned.

In job shop work you come across some people who do not care for the cost in the foundry, they want a cheap pattern, never mind the molder. They buy their castings in a job foundry and if they only knew it they would buy better patterns and get castings at a lower price. This would result in better feeling toward the patternmaker who made the pattern. There are other customers who will pay for good work saying that some day they will make their own casting and will want good patterns.

Patterns well made for standard work are the cheapest even if they cost twice as much as the cheap pattern which will go to pieces in a short time and the molder will be continually in trouble trying to make a good casting from a poor pattern.

To show you what it means to have a good pattern I will give you an example: The Erie City Iron Works in 1891 made a line of center crank engines; these bed patterns have been used by the foundry for thirteen years. They have been altered to suit new conditions but we have never made a new pattern for one of those beds. When I made the pattern for the cylinders I consulted the foundry foreman and explained to him the way I thought was best to make them, showing him the blue prints and after looking over the prints he said, "Go ahead, it suits me." Well, I made the first cylinder pattern and as soon as it was finished sent for our foreman and said to him, "That cylinder is ready if you wish to make it." He examined it closely and said, "I can never make a mold from that pattern." I answered by saying, "You will have to try, you agreed with me to make it that way, and I cannot destroy it now." So I sent it to the foundry. He said he would make it and do his best and he did it. The cylinder was cast and he acknowledged it was the only way to mold them and they are molded the same today. That goes to show that no matter how old we are or what experiences we have had, that there are new ways of doing things, and we should try even if we make a failure. Better to fail in an undertaking than to sit down and let the other fellow win, and then say I thought of that years ago, that is my idea, I think he must have heard me whisper that to somebody. Or if he fails you say, I told you so, he should have known better. The firms we are working for should encourage the foremen to put their heads together and try and work out new methods; even if the said foremen do make failures they will find that perhaps the number of failures will not be as great as the number of successes and the firm will be sure to make a profit in the end by encouraging them to renew their efforts to cheapen their methods of production. In work of this kind the relation of pattern shop and foundry would be very close and it should be a unit. In closing my remarks I would say that perhaps I have spoken more from the standpoint of the patternmakers than the molders. My reason for doing so is that I am speaking to foremen molders and wish them to understand as near as possible the position in which the patternmaker is placed in his relation to the molder. There should be a good feeling between them and the patternmaker foreman should do as you are doing, form an association of patternmaker foremen and become a branch of the American Foundrymen's Association or join with foundry foremen's association, and let the relation of pattern shop and foundry be such that it will create a sentiment in both departments that will promote the best interest of our employers.

An Answer to the Author of the Verses Entitled "The Patternmaker."

No doubt of it, Sir, you're an exquisite blade,
With proper high school education:
Acquainted with every conceivable trade,
And its wealth and its worth to the nation.
What is more to the point, you're a genius by birth—
In short, the Almighty's caretaker;
To see that mankind do their duty on earth,
From king to obscure patternmaker.

'Twas modest, of course, to begin so far down,
When royalty might claim your attention:
The doings of many now wearing a crown,
You know will not bear close inspection.
Of course in due time you will go for the rest,
From fishwife to quaint Indian fakir.
So, no living mortal dare deem it a jest—
Your fling at the poor patternmaker.

What limb of the law, behind some old tome
In future may hope to find shelter?
The pitiless fire from your pelting "pom pom"
Will send the whole batch helter skelter!
Alas! Each shrewd doctor, with plaster and pill
Of defeat he must be a partaker:
For the force of your ridicule surely will kill
Him, as dead as the meek patternmaker.

Then as to the clergy, the pope can't be proof
Against your artillery thunder.
Whilst bishops and laymen must own it a truth,
Should they wrestle with you, they'll fall under.
The woe-begone tramp, or brisk millionaire,
Or landlord with wealth by the acre
Must all live in dread, for the same fate they'll share,
As the innocent, mild patternmaker.

But a truce to all strife! Did each mend his own ways,
Nor point out the faults of his neighbor:
'Tis an old plan that pays, and o'er again pays,
A good percent on the labour.
The sweep may be black, neither learned or staid,
And dusty the hard-working baker:
But what of it all? 'Tis the way of each trade
From proud prince, to prim patternmaker.

And now, my dear sir, as you travel along,
Through the world, pray this truth be minding.
Rather cheer up a mate with a joke or a song
Than nag him with petty fault finding.
Let mercy still temper your speech and your pen,
Though dealing with desperate law breaker.
The best of us, doubtless, may err now and then,
And so may a plain patternmaker.

W. T.

ECONOMY IN MELTING.

BY J. P. PERO.

During the past twenty years, in fact since the use of coke for fuel has become the universal practice in melting iron in the cupola, much has been written on this subject and gigantic strides have been made in cupola construction and in a more intelligent method of operating the cupola, particularly in the details which are most prominent in obtaining economy in melting.

True economy in melting is obtained when the cupola produces iron which is in every respect suitable for the work in which it is to be used, in addition to melting the greatest possible number of pounds of iron to each pound of fuel used. The attempted economy which sacrifices the quality of the iron in trying to reach a high ratio of iron to fuel is an extravagance. The foundryman who learns that the ratio in a neighboring shop is 12 to 1 and finds his ratio is only 9 to 1 would better consider carefully all the conditions before he fully determines that his method is faulty, or that his results are not economical. We all admire and respect the man who is dissatisfied with himself when he believes he is not doing his very best, for he is of the class of men who are responsible for the wonderful progress made in foundry practice in the past, and we also commend the good judgment of the man who knows when he has reached the point which means best results. Local conditions have a very strong bearing upon results in cupola practice. Cupolas identical in design and size, with blowers of equal capacity, are seldom alike in their working when operated by different men, even though their rules and methods may appear the same. Every foreman and every molder knows that "Old Tom" could do anything he wanted to with the cupola, and when he was out for a day or a week the other fellow hardly got decent iron, yet all his stock and fuel were weighed and charged in just the same quantities Tom used. Why should there be such a difference? Because Tom knew how to handle the cupola in every operation from cleaning out the bottom until the bottom dropped. The preparation of the cupola plays a very important part in its working, the excess of slag and cinder in the melting zone should be closely chipped off, leaving no irregularities in the shape of projections or depressions, in all cases following the shape naturally formed by the melting process, the space below the tuyeres should be neatly chipped. The daubing or lining each day is very often responsible for poor results in the working of the cupola. The clay should have sufficient sand mixed with it to have the mixture porous and refractory. Clay used too

wet will crack and scale off in drying. This is caused by the heat forcing the moisture to the surface, and if the clay is too wet there is an excess of moisture and the heat is sufficient to generate steam, which in escaping to the surface blisters off large patches of the clay, and when the blast strikes the lining (if not sooner) the lining is in no condition to resist the action of the intense heat in the melting zone, and soon falls off, mixing with the charges of iron and fuel, causing delay in melting and utterly failing in the purpose for which it was intended, namely, the protection of the fire brick in that portion of the cupola.

A daubing or clay lining put on too thickly produces the same results as a lining too wet, and for the same reasons. It is advisable to use as thick a lining of clay and sand as the cupola will carry. Just how much can best be determined by the man most familiar with the working of his cupola, but in most cupolas about three-quarters of an inch in thickness is a good starting point, and this thickness should be increased until the safe limit is reached. The proper blast pressure, as well as the proper distribution of blast, in connection with the requisite tuyere area, are also important factors in economical melting. Many melters contend that a cupola should be closely charged, that is, the iron should be placed so closely as to prevent the free passage of the gases through the charges of fuel and iron. It has been the experience of the writer that a cupola charged in such a manner as to allow the free passage of the gases through the charges above the melting zone invariably produces the best results, for such a method reduces the pressure at the tuyere openings by offering less resistance, and at the same time facilitates the escape of the gases and their absorption by the charges above, thus raising the temperature of the iron in these charges and making the iron yield more readily to the action of the heat in the melting zone. Some years ago the writer devoted a great deal of time and personal attention to the workings of the cupola in his charge and became so fully convinced of the advantage of charging in such a manner as to allow of the free passage of the gases that he first suggested in 1889 the erection of cupolas with two charging doors, the first or lower door to be from 12 to 15 feet above the bed, and the second or upper door to be 10 to 12 feet above the first. The idea or theory advanced was the greatest possible utilization of the heat generated from the fuel used, and to that end advised the following method of charging the cupola: The cupola should be prepared in the usual manner up to the point of putting in the door for kindling. There should be a liberal supply of shavings spread over the bottom in order to prevent the wood from being forced into the sand bottom by the weight of the charge to be put on later. A sufficient amount of wood to light the coke should then be put in and arranged in such a manner in the first layer as to form channels or air spaces to conduct the air from the breast hole to the whole surface of the cupola bed. The next layer of wood should be laid crosswise on the first, the balance of the wood should then be put on in the regular manner and sufficient coke for the bed next put in. The cupola should then be charged in the regular manner, alternating fuel and iron until the first or lower door is reached. This door should then be closed and secured properly on the outside to prevent its being forced open by the weight of the subsequent charges.

The charging up to this point should be done through the lower door, and after it is closed and secured the melter should go down through the upper door inside the cupola and make a tight joint at the lower door with a mixture of clay similar to the mixture used in lining the cupola. Charging should then be resumed through the upper door until the upper door is reached, and any subsequent charging should be done through this (the upper) door. The lower door should be used simply to facilitate the placing of the first charges in the cupola, but might easily be used at the latter part of the heat, if it were found necessary to charge more iron than had at first been intended. About an hour or an hour and a half before time to put on the blast the fire should be lighted, and after it had become well started the breast should be made up. The draft can easily be regulated by the tuyeres after the fire has become well lighted. This suggestion provoked considerable discussion both favorable and otherwise. Many considered it too radical a change from existing methods, some opposed it on the ground that it necessitated new cupolas, and an additional charging floor with the necessary elevator changes, but finally the economical feature of the plan appealed to some of the more progressive foundrymen, and there are many cupolas now constructed on this plan. Unfortunately for the writer, just at that time his interests led him away from the active work in foundry practice, and

later on when he returned to foundry work he entered a line of work dealing more particularly with air furnaces, and while he has seen several cupolas constructed in the manner described, he has never had the pleasure of having them under his management.

Some time since in the columns of *The Foundry* the following advice was given, in connection with other remarks on cupola practice, "About 1½ hours before charging, or two hours before putting on the blast, light the fire." This quotation may not be verbatim, but I believe it is correct in substance. We have known in a general way the writer of the advice quoted, and have found much to interest and instruct us in his writings, and in turn we would like to suggest that to us it seems not only unnecessary but absolutely wasteful to burn fuel to no purpose for 1½ hours, or for less time, before charging the iron.

In our opinion the old time instructions furnished by cupola makers, viz., "After the fire is well burned through the bed of fuel, begin charging," was not good practice, and we believe that every atom of heat from the fuel, beginning with the shavings and wood and ending with the last charge of coke, should be absorbed as far as possible by the iron to be melted, in order to procure the most economical results. Not every foundryman has at his disposal a cupola with two heights of charging doors, but every foundryman who uses a cupola may easily charge his cupola before lighting his fire, and by so doing will appreciably increase the ratio of iron to fuel, without depreciation in the quality of the melted metal, but with a saving in the wear and tear of the cupola, and a saving in time of melting.

SOUND PUMP CASTINGS.

SOUND PUMP CASTINGS.

BY JOHN M'CUNE.

It is a well known fact that water under pressure will force its way through any soft or porous places in a casting, and hence pump cylinder castings, especially those intended for high pressures, should be made of close grained iron. The designer of the pump is in a far greater measure responsible for irregularities in the casting than the pattern-maker, for it is a very important matter that the metal thicknesses in different parts of the cylinder should be as uniform as possible.

Where pumps are to be exposed to acid

waters, as in many mines, a chemical action takes place in these porous places and the interior is rapidly eaten away. The accompanying illustration shows a piece broken from the cylinder of a plunger pump made by a prominent manufacturer. In this style of pump two plungers work in opposite ends of the barrel and there is a dead head or partition cast in the center. In the particular form shown a flat base was arranged under this central partition and the mass of iron in this base is considerably thicker than that in the walls of the cylinder or in the partition. As a consequence there was a porous place in this mass. The acid mine waters penetrated the porous iron and gradually dissolved the metal until there was an opening connecting with the two ends of the pump, as shown in the half-tone.

If any one will notice the interior of a blow hole he will see that the metal is not covered with a scale, and hence is in the very best possible condition to be dissolved by acids. On this account, every precaution should be taken to prevent acid water from finding its way into such cavities.

In another pump of a different make, the division between the two ends of the cylinder was made about twice as thick as the cylinder walls and was not ribbed. These heads would only last a few weeks when the cylinder would have to be renewed. Upon examining them it was found that the porous iron had been penetrated by the acid waters and hence the head had been rapidly dissolved. The designer up to this point had been blaming the foundryman for bad iron, but when the foundryman called his attention to this fact he tried his hand at solving the difficulty. He made the partition slightly thinner than the cylinder walls and added ribs to give it the desired stiffness and strength. The result was that he was sure of getting a sound head and, to the surprise of everybody, these thinner heads lasted many times as long as thick ones. We should like to hear from other parties in regard to their troubles with pump castings.

The Blakslee Foundry & Forging Co., of Cleveland, O., has been incorporated with a capital of $150,000. This company has been doing business for some time, but has only recently decided to form a corporation. The incorporators are: J. R. Blakslee, Frederick L. Taft, T. W. Hill, J. R. Blakslee Jr., and F. O. Brinker.

MELTING CAST IRON BORINGS.

BY DR. EDWARD KIRK.

I have followed the recent articles in *The Foundry* on the melting of cast iron turnings and borings very closely, with the view of learning something new in this line. But so far I have not been able to discover anything new, as the modes of melting and testing described were tried many years ago by myself and others, and are fully described in my second edition of "The Cupola Furnace," as is also the melting of shot iron, iron from dumps, etc., which belong to the same class or grade of metal. I consider that it has been thoroughly demonstrated that the best way of melting this iron in a cupola is to pack it in wooden boxes, each holding about 100 pounds, and made of one-inch hemlock or other cheap lumber, and melt it alone for sash or balance weights or melt it with soft pig and scrap, at the rate of 5 percent of the heat melted for regular castings. About 5 percent appears to be the limit to which it can be used with any degree of certainty as to soft iron. When melted in this way, the iron may be used for heavy castings and jobbing work, but should never be used for stove plate, bench work, or other light ladle work. For if the iron is drawn from the cupola by a continuous stream as fast as melted, into hand ladles, hard iron may be caught in one ladle and soft iron in another, as is always the case when an extremely hard iron is melted with soft iron. It is only by drawing the iron into large ladles and giving it an opportunity to mix, that iron melted from turnings and borings can be used for castings that are designed to be soft.

The quality of iron is also improved by stirring it in the ladle with an iron bar or polling it with a hard wood stick, but even after all these precautions have been taken, the degree of uncertainty of resultant mixtures is so great that I think I have never known a founder making soft castings to continue to melt them for any great length of time, even after satisfactory test heats have been made. The reason for this is that the conditions under which the test heats were made do not always prevail in the foundry, for in the testing every precaution is taken, only clean cast iron turnings free from rust are used, and these are properly packed in boxes, the boxes tightly closed and carefully placed in the cupola to prevent breaking. The iron is melted hot and of an even temperature throughout the heat,

and is carefully mixed and poured. While, after the test heats have been made, rusted and dirty turnings, mixed with wrought iron and steel turnings, may be shoveled into the boxes; the boxes may not be properly nailed, and the turnings escape when thrown in the cupola, or the boxes may be broken by careless charging of the pig iron or heavy scrap upon them. The iron when melted may be too dull to properly mix, or the molder may be in too big a hurry to give it time to mix, and results are totally different from those shown by test heats. The result in every instance that has come under my observation has been that hard castings, uneven shrinkage and blow holes have caused this practice to be discontinued. My latest experience in melting this iron was a few months ago, when a founder applied to me for assistance in melting it. I informed him of my experience, but stated that I had never tried it with a high silicon iron. He decided to try it with this iron, and a ferro silicon pig, guaranteed to carry 90 percent of scrap and make soft castings, was procured for the test.

Several tons of turnings were melted with the pig in different proportions at the end of the regular heat, and the iron run into pigs. The result was a very uneven iron, showing hard spots in the pig, which appeared to increase with the increase of silicon pig. None of the mixtures made were deemed suitable for the work being cast or proved satisfactory when tried; when the pig was remelted with the regular mixture, the hard spots disappeared and were not noticed in the castings, but it was thought the present price of iron would not justify the remelting of the pig, and the practice was discontinued. The best results were obtained in these tests with 25 percent of the silicon pig.

In a few cases where car wheel foundries have bored their wheels before shipping, the borings have been melted successfully in their mixture for wheels; in these cases, the borings were found to increase the depth of chill, and the mixture of pig had to be changed to give the desired chill. A number of founders whom I have met have put in a sash weight floor for this iron, and other scrap unsuitable for castings, and melted it in boxes at the end of a heat. This has been done successfully, and since there is always a market for the standard sizes of sash weights and they can be molded with cheap labor, with proper equipment, this is probably the best way of disposing of this class of iron where there is no market for it.

There is nothing in melting this iron and running it into pig, for its costs $2.00 per ton to melt iron in a cupola, and in special small heats may cost as high as $5.00 per ton. The iron is not improved by melting and is worth no more in pig than as scrap, and the poorest iron the founder has to deal with is his own make of pig. As a rule it mixes with no other iron to make a homogeneous casting, and is piled in the foundry yard, where I have known it to remain for twenty years. It is more profitable to sell all iron not suitable for castings or consign it to the dump than to cast it into pig to be piled in the yard.

I agree with Mr. Outerbridge when he says he is not an enthusiast in melting this iron for castings. For while it may be done successfully, there are so many drawbacks to its success in making castings, that out of at least twenty foundries that I have known to try it, every one gave it up after a short trial, and in some instances said it was more profitable to throw turnings in the dump than to melt them. I do not think Mr. Keep, who appears to be advocating the melting of this iron, can have had a great deal of experience in melting it, and he certainly can never have melted it in a stove plate mixture.

C. S. Martin and Frank Cheney have purchased the foundry formerly owned by John McDermaid, of Rockford, Ill., and will reopen the plant and carry on the business as a copartnership.

The Milwaukee Coke & Gas Co. have moved their Chicago office from the Fisher Building to 221 North Branch St., thus consolidating their office with their sales department and yard. The move was made to enable them to handle their business more promptly, and thus serve their customers better.

The Pioneer Foundry Co., La Crosse, Wis., has purchased the Bell Machine Co., which has been operating a machine shop in that city. The Pioneer Co. will for the present operate the Bell plant at its present location, but in the near future the equipment of the Bell plant will be moved to the Pioneer Co.'s buildings, which will be rearranged and remodeled and fitted for the automobile business. It is also proposed to begin the manufacture of engines.

REVIEWS.

Steel Founding.

Stahl und Eisen, Nos. 11 and 12. A very elaborate review of the German steel casting industry appears in this journal. It is from the pen of Bernard Osann. After describing the excellent steel castings exhibited at the Duesseldorf Exposition, he branches out into the difficulties attending the successful production of this class of work.

In general steel castings are made in dry sand molds. The almost vitrifaction of the mold is productive in fire cracks, which, while not usually serious, endanger the cohesion of the sand somewhat. Again this mass offers much resistance to the proper contraction of the metal, and hence very heavy strains are the result, with attending shrinkage cracks. To offset this trouble much can be done in the way of proper designing, keeping the thickness of the metal fairly uniform throughout, otherwise when the thinner portions have set completely, the thick ones are still mushy and tear apart. If the design cannot be changed, the mold can often be broken apart as the metal begins to set, at the proper places, thus relieving the metal. Then again, pieces of wrought iron may be put in the places which are to cool most quickly, so that the whole may set about the same time. This expedient, however, is to be used with the utmost caution, and only when nothing else will do. Connecting pieces between heavy parts, which tie them together, also help the work.

The cracking of the casting when cold is more dangerous, and usually comes from the heavy interior strains released by sudden blows. The fly-wheel and the sheave are good examples of this. Very often cold water must be run through the hub to save the casting. The best solution of these difficulties lies in proper annealing while the castings are still hot.

Shrinkage spots are often found in steel castings, and occasionally connected with the outside air. A proper casting temperature, plenty of feeders, are what is wanted here. The shrinkage of the metal is so great in itself, that we can figure on six percent of the total weight of the casting as having to be fed in after filling the mold proper. As it is manifestly impossible to feed in liquid steel from the same heat, this means very large feeders and risers unless a crucible steel plant is kept in operation for this purpose alongside of the open hearth apparatus. In the latter case the feeders can be left smaller. This setting of feeders is very important. The general rule is that the flow of metal into the casting should not be cut off by the setting of the metal until the duty of the feeder has been accomplished. This rule applies to all kinds of castings, it would seem. It is therefore necessary to place the feeder where the steel can get into the cross-section in the most direct manner. A large surface would have feeders distributed all over the space. Pouring molds bottom upward will not do for steel, the metal cooling too much in rising to the top of the mold. It is often necessary to incline the mold and shoot the metal into it from the highest point to get good results. These feeders, moreover, mean considerable machine work, hence machine shop and foundry should be in close touch with each other in the steel foundry. To get clean surfaces, it is advisable wherever possible, to place these surfaces face down. Where both top and bottom must be clean, a prolongation of the mold is made above, so that the slag may drive into it, and collect. This material is subsequently cut off.

The influence of heat treatment is next dwelt upon. Not only is it good to remove the casting strains in this way, but the metal is given a micro-structure which is far ahead in quality to that which it had when taken from the mold. Castings should be heated up to a point between 1800 and 2000 degrees F. and then cooled fairly quick down to 1100 to 1300 degrees F., and held between the last named points for some time before finally allowing to become cold.

It is possible to cast steel into green sand molds. This is done considerably in England, but the molding sand is varied in composition according to the section wanted in the casting. It is a question if the cleaning cost does not overbalance the additional money spent for dry-sand work.

Running the Cupola with Heated Blast.

Eisenzeitung, No. 25, discusses the desirability of preheating the blast for more economical melting. It is well known that the imperfect combustion of the fuel in the cupola is very wasteful to heat, but so far the apparatus that seemed necessary to utilize some of the escaping heat units has proven too costly. The firm of Koch & Kassebaum, of Hanover, recently put up a cupola in the upper part of which there were placed a series of tubes through which the escaping gases had to pass.

A wind box surrounded these tubes, and allowed the blast to circulate about them before entering the cupola. Marked saving in the fuel bill is said to have been the result. What the effect of the hot blast on the quality of the iron turned out to be is not stated.

Aluminum in the Foundry.

The Mechanical World, June 8. Walter J. May tells us that aluminum removes the gases from iron, causes a softer skin on castings, and increases strength. It will not help to make the castings any sharper, however, in fact tends the other way. Charging aluminum or its alloys into the cupola simply wastes it. It should be used only in the ladle. The best form for the aluminum is in the shape of a ten percent alloy with iron, and added in the ladle.

Blow-holes in Castings.

The Mechanical World, July 1. J. A. Phillips recently bought a lot of cast engine scrap, and in looking it over was struck by the number of blow-holes in nearly every piece. This led him to look into the question, and he concluded that this disagreeable phenomenon is produced by dampness, or clods of coal dust at the face of the mold, too much phosphorus, and dirty and unduly rusty scrap. He infers that molds should be poured with hot clean metal. Where hot metal is to be used unusual care must be taken by the molder in his work, otherwise scabs and other troubles may appear. Proper venting of mold and cores is urged, but this with caution. Mr. Phillips holds that if a man were to go into every foundry and cut the points off every vent wire, the industry would be correspondingly benefited. Patterns would not be so pock-marked, and the sand would not be in direct communication with the outside air at every place vented. Too much venting, he says, is often the cause of blow-holes.

Direct Metal in England.

Iron and Coal Trades Review. Thos. Butlin & Co., of Wellingboro, who have been making foundry pig iron for the last fifty years, recently added a foundry department to their establishment, in which the metal as tapped from the blast furnace is used for casting purposes. At present they are making segments for the various London tubes, each segment weighing some 600 lbs.

The foundry was formally opened by Lord Lilford, and suitable loyal and foundry toasts were given and responded to at the collation which followed.

This English item is interesting to us on account of the recent scramble for the tunnel plate contracts of the Pennsylvania railroad. There is no reason why these castings should not be made directly from the blast furnace, though we would interpose several regulating processes to make the metal used more uniform and of better quality for the purpose intended. Direct metal is apt to be too variable in composition and occasionally too rich in total carbon.

Core-Making Machines.

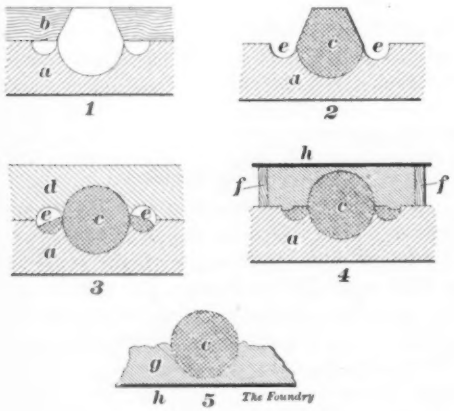
Zeitschrift des Vereins deutscher Ingenieure, July 9. Mr. Oscar Leyde, of Berlin, contributes an illustrated article on the machines now used for making cores. The present tendency in core-making is to do away with the clumsy work of men, at least for small cores, and to turn this over to women and children. Even this advantage, however, is not enough, and hence the core-making machine has made its appearance. Space saved, as also uniformity and superior excellence in the product, is helping this movement along.

The simplest form of mechanical core-making device is operated on the principle of a plunger sent upward by a lever. The core-box, cylindrical outside, and square, round, or any other suitable shape inside, is let into the bench, and the core made as usual by hand. The plunger is then operated to force out the core upward.

Next came the American idea of the sausage machine, which squeezes out the finished core to any size and length, perfectly vented. The limitations of this device are, however, marked, as only prisms can be turned out, other shapes being out of question.

An altogether different device, and of more universal application, is that of A. Knuettel, of Renscheid, Germany. This amounts to practically a molding machine, though the trick lies in the arrangement of the core-box halves. Let us suppose the drag of the core-box, containing some dozen miscellaneous core-halves, is laid down horizontally. A temporary filling frame is now laid on, which limits the amount of sand it is possible to put on. The surplus is struck off, and the form lifted, leaving the depression in the drag filled, and a cone shaped heap above every portion of it. The cope is now put on, and the two pressed together by machine. The surplus sand finds its way into suitable grooves cut just alongside of the

cores in both cope and drag. The cope is now removed, a frame put on; this is filled with loose sand; a plate put on it, and the whole reversed. The drag being lifted off, the finished core, resting on a plate of sand, and ready for drying, is the result of these operations.



The process is best seen in the accompanying diagram. In the first illustration we see the drag *a* covered with the filling frome *b*. Next the latter is taken off and there remains the core sand *c*. The cope *d*, in the next figure, has been placed on with pressure, resulting in forcing the excess sand into the grooved channels *e* surrounding the core proper. In the next illustration we note the frame *f*, filled with loose sand and covered by the core plate *h*. Reverse the figure, and take off the drag, and there is left the core supported on loose sand and ready to bake.

Even with a set of miscellaneous cores operated by the machine, it will be readily seen that the production can be made very great. The data given as an example refer to a core-box mold 12 x 26. From eight to thirty sets were made per hour, depending upon the nature of the cores. The number of separate cores in these molds were from 60 to 200 per hour. There should be room for many such machines in American foundries.

THE RAMP MOLDING MACHINE.

In the case of molding machines in which the mold is filled and rammed up by hand, the machine itself only serves to ram the sand and hence is only in use a small fraction of the time. Recognizing this fact, Mr. Ramp has so arranged his machine that from two to four gangs of men can have their molds rammed on the same machine. The advantages of this are that with a given outlay or expenditure for a machine from two to four times as many men can be employed, and from two to four times as many molds put up per day as can be handled on the ordinary squeezer machine. This machine is built in a large variety of sizes to suit different classes of work.

The iron flasks are placed on light, easy running cars, which have access to the machine from four directions. Compressed air is used for operating the machine. The cars carrying the flasks are so constructed that when the sand is being rammed there is no strain on the car or carriage, as the flask is sustained by the block upon the bed of the machine. After the mold is rammed, and the pressure of the ramming block is released, the cars are free again and can be withdrawn to the starting position. This arrangement makes it possible to use light, easy running cars, which require no adjustment by the operator.

Patterns of a general description can easily be placed on match or follow boards and are drawn from the mold after the latter has been removed from the machine. Stripping devices have not been used very generally with these machines, although there is abundant opportunity to do so.

This molding machine has been used, not only for ramming molds, but has also been found very useful for ramming or pressing large cores. A machine of this type especially fitted for this purpose has recently been installed in the foundry of the General Electric Co., at Schenectady, N. Y.

The Ramp machine was designed some seven years ago by Mr. O. B. Ramp, but has recently been remodeled and improved so as to greatly increase its efficiency and capacity. The machine is made by the Ramp Molding Machine Co., West Burlington, Ia.

MELTING RATIO IN CUPOLA PRACTICE.

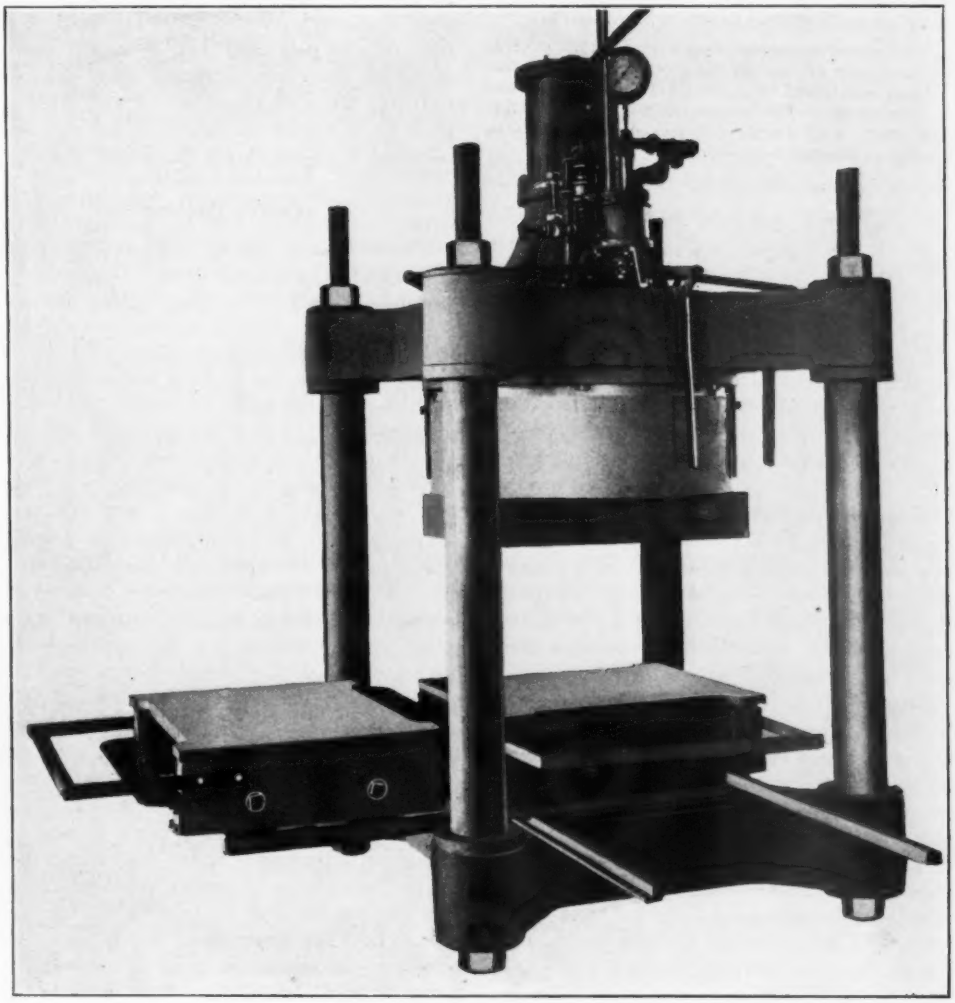
BY ARTHUR G. HENRY.

A great deal has been written about the amount of iron that can be melted with one pound of coke. There are so many conditions that have to be taken into consideration that it is a very difficult matter to define what is a good ratio. The following conditions must be considered: 1st. The diameter of the cupola. 2nd. The height of tuyeres above the bottom. 3rd. The kind of scrap used.

It stands to reason that a cupola of a 60" inside diameter running a heat of 20 tons will not show as good a ratio as when the same cupola turns out a heat of 50 tons. In good

cupola practice it is imperative that the coke bed must always be the same irrespective of the amount to be melted, thus insuring good hot iron throughout the heat, which is most important in good foundry practice.

The amount of coke used for each charge of iron must be regulated by the scrap. If the scrap is small, less coke can be used, if large, the coke must be increased. In other words the coke (to a great extent) can be made to give good results, providing it is used with sound, practical judgment. The writer has had considerable experience with different cokes, under various conditions, and has come to the conclusion that it would prove more beneficial, ultimately, if the final results in the foundry were taken into consideration and leave the ratio of coke to iron in the background, and figure out the cost of fuel used to melt one ton of iron and then compare the amount of bad castings with the same. Many foundrymen are apt to blame the coke for cold iron and a high percentage of bad castings, but as a rule these faults can be traced to somebody who is ambitious to make a "ratio." As it is a great deal cheaper to buy scrap than to make it, it would be cheaper in the long run to pay more attention to keeping up the temperature of the iron which can be obtained, not by a fixed ratio, but by using coke according to existing conditions.



THE RAMP MOLDING MACHINE.

METALS IN FOUNDRY PRACTICE.

Devoted to inquiries from Practical Foundrymen on subjects relating to the Melting and Using of Cast Iron, Steel, Brass and Bronze.

We are glad to announce that the Cast Iron Notes, as formerly, will be written by Mr. W. J. Keep, and also that we have secured the services of the following well-known experts to answer inquiries along their special lines:

J. B. Nau, Metallurgy of Steel and Steel Castings.

Dr. Richard Moldenke, Malleable Castings.

We have also made arrangements with several others to act as special contributors upon Brass, Bronze and other subjects. All inquiries should be addressed to the Editor of THE FOUNDRY, and they will then be forwarded to those in charge of the different subjects.

CAST IRON NOTES.

BY W. J. KEEP.

Varying Strength of Test Bars.

Question: "We have always noticed that the breaking load of test bars cast in the same mold varied considerably. For example—Companion test bars 1 in. sq. by 12 in. long, broke at 2,600 and 2,300 lbs. Another pair 2,400 and 2,660 lbs. None of these bars showed any indication of flaw that could be detected with a magnifying glass. We cannot understand why two test bars poured from the same runner, molds setting level, should not run practically uniform. A prominent founder states that in many years his test bars have run with practically no variation."

Answer: This founder is mistaken about the test bars made in his shop. The strength of two test bars cast together is scarcely ever the same. Cast iron is not a uniform material, I have before me the test records of 25 pairs of test bars cast by different eastern founders from instructions supposed to insure the greatest accuracy. These were tested by one of the most reliable engineers. Six of the pairs showed the same strength for each bar; 3 pairs in round numbers showed a variation of 3 percent, 3-6 percent, 6-9 percent, 1-11 percent, 1-12 percent, 1-17 percent, 1-19 percent, 2-20 percent, 1-21 percent. The average variation of all was 8 percent. This is about as near as they will ever run.

Your variation (divide the difference in strength of two bars by their average strength) is 12.24 per cent and 10.27 per cent which is high. You will no doubt find from day to day that your average is no higher than the general average of say 6 percent.

Uniform Shrinkage.

Question: I want to make 50 or 60 dryers for cores 12 in. by 14 in. and they must all be exactly alike. So far I cannot get them to shrink alike.

Answer: If you could take enough iron, to pour all, from the cupola at one time, or better catch it in one mixing ladle and then pour all at the same temperature you would come as near uniformity as possible. The iron at the first of a cupola heat has a much greater shrinkage than iron taken out later. The last iron has the least shrinkage of all. This applies to a cupola melting iron of the same chemical composition for the whole heat.

Cupola Daubing.

Question: Can you give me a mixture that will withstand heat and protect the brick in a cupola? We are using about 1-3 fire clay with 2-3 good plastic loam, but this does not protect the brick which burn out so that we are obliged to reline the melting zone every three months. We use 12 to 14 oz. blast with good solid coke and 10 to 12 oz. with low ash coke and we melt about 12 tons per day.

Answer: No ordinary daubing will resist heat as well as the brick. A very thin wash or coating of ground crucibles or graphite would protect the brick but would be expensive. It is best not to use much daubing. If quite a hole burns in the lining cut out one or more bricks and with fire clay put in enough bricks to fill out the lining. For a small depression cover the surface with clay and press into it a thin piece of brick to make the surface even. Clay should not be used alone because it will crack and fall off when heated. Mix with it all the sharp sand you can. The clay should be soaked in a kettle or box for 24 hours (hot water is better than cold), then stir in from one to two times so much sand as clay and put on just as little of this as possible to hold the small pieces of fire brick. To give the cupola a workmanlike appearance spread over all just enough of the mixture to make all of one color. If you work in enough sand and pieces of fire brick the daubing will not shrink enough to come off, and will make a permanent lining.

I like to let a cupola have its own way as much as possible and let the slag build out slightly in a circle just above the tuyeres which will keep the lining from burning opposite the melting point. Simply fill up holes but don't try to keep the lining out to its original lines.

Melting Ratio.

Question: We have one cupola 36 in. inside of the lining and 14 in. from sand bottom to tuyeres; another 54 in. inside lining and 17 in. to tuyeres; both have a second row of tuyeres. Our melting ratio is about 5 to 1.

Answer: The proportion of your cupola is correct. For the most economical melting I would close up the upper tuyeres and make the inner opening of each of the lower tuyeres flare out to twice its present width. Find how much coke it will take in each to reach 18 inches above the lower tuyeres and use this weight for the bed. The bed of the large cupola will approximate 1,600 lbs. and 600 for the small.

Make the first iron charge for the large cupola 5,000 and for the small 2,000 lbs. Make the regular charges of coke 300 lbs. and 150 lbs. and the regular iron charges 3,000 and 1,500 lbs. You can drop off a few pounds of coke from the last two or three charges.

To avoid danger it would be better to change your present charges, bed, etc., a little each day until you get to the above.

If you melt more than 12 tons in the large cupola or 5 tons in the small you had better tap slag after the fifth charge is melted.

STEEL FOUNDRY NOTES.

Melting Steel in the Cupola.

Inquiry. In the foundry where I work we have been experimenting on making steel castings from Bessemer steel. For many years we made the molds in the foundry and took them to the steel mill, where they were poured. They now want us to pour them in the foundry by melting the steel in our cupola. We have tried it three or four times, both before and after having a heat, but the steel has always been too hard. We have an idea that it is the iron that sticks to the cupola after our heat that combines with the steel and makes it hard. Can you give us a remedy? We have charged as high as 2,500 pounds and did not get 1,000 pounds out. Can you tell us the cause of this? We get the metal white hot and so cannot think but that it is hot enough. The material charged consisted of the crop ends from billets used for making steel tubing.

Answer. The foundry cupola is not the kind of apparatus that should be used for such a purpose, owing to the temperature obtained not being high enough for good results. The melting temperature of pig iron varies between about 1,050 degrees and 1,250 degrees C., and the temperature of the liquid metal running from the cupola will be less than 1,300 degrees C.

The melting temperature of soft steel billets used in making steel pipe will usually be above 1,400 degrees C. As a result, under the conditions you mention, no melting could be expected, but this soft steel, heated to a very high temperature in the melting zone of the cupola, in the presence of incandescent coke, will rapidly absorb a sufficient amount of carbon to lower its melting point below the limits at which the metal will melt in the cupola.

The 1,000 pounds of so-called steel obtained will probably be found to contain a high percentage of carbon, rendering it perfectly liquid under the existing conditions, while the 1,500 pounds not drawn from the cupola, did not come sufficiently in contact with the incandescent fuel to absorb carbon enough to lower its melting temperature to where it would become perfectly fluid. It either does not melt or becomes pasty and sticks to the bottom and sides of the cupola.

The only remedy we can suggest is to abandon the use of the cupola and to replace it by one of the following: the converter, the open-hearth furnace, or the crucible, the choice to be guided by the kind of raw material that can be obtained, or the kind of steel it is desired to make.

J. B. NAU.

BRASS FOUNDRY NOTES.

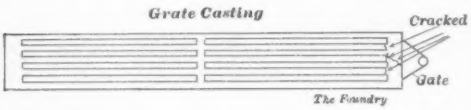
Brass and Bronze Notes.

Query. We have to make some small connecting rods from 10 to 15 inches long and should like to know a good composition of phosphor bronze from which to make them. Also, would it be necessary to bush the bearings and ends of the rods?

Answer. If the writer will use a composition of 80 parts copper, 10 parts lead and 10 parts tin, he can make castings for the connecting rods mentioned, and as this mixture is one of the best known bearing metals on the market today, it would not be necessary to bush it unless it is to avoid the wear of the rods. The same composition can be used for a bearing metal for casting liners. If scrap metal is used for the mixture, a little phosphor tin can be substituted for part of the tin.

A GRATE BAR DIFFICULTY.

One of our subscribers sends in a sketch of a grate bar as shown in the accompanying illustration. He states that this was cast from a mixture of one-half southern and one-half northern iron, the mixture being very soft. In the past they have had no trouble whatever with the bars cracking. This set of bars was gated and cast as shown in the illustration. The copes were thrown off in the evening, and in the morning the grate bars were found



cracked as indicated in the illustration. The suggestion which we would give is that the gate be broken off as soon as it is set and the cope lifted off. Also that care should be taken to cool the center bars more rapidly than the outer ones if possible. This necessitates that care be taken not to disturb the outer bars in the mold and that preferably they be covered with some sand while the center bars are uncovered.

We submitted this question to a founder who has had considerable experience along this line, and his opinion was practically as above. We should like to hear from others as to their experience along this line.

ASSOCIATIONS AND SOCIETIES.

Meeting of British Foundrymen's Association.

The newly organized British Foundrymen's Association held a meeting at Owens College, Manchester, England, on Tuesday, Aug. 2. This association is the outcome of considerable correspondence in the British trade journals, and begins operations with eighty-three charter members.

Mr. Robert Buchanan was made president, and Mr. F. W. Finch secretary and treasurer. Both gentlemen are well known professionally in the foundry world. Cordial relations have been established with our American Foundrymen's Association, and much is hoped from this interchange of ideas from both sides. Mr. H. Pilkington was elected vice-president, and in accepting this honor, remarked among other things that while America was undoubtedly ahead of every one else in the technical side of the foundry industry, Britain had nothing to fear on the practical side. He fully expected to see a live foundrymen's association remove the advantages America still had technically. Our American foundrymen will be much pleased to see this done, as they are only too anxious to see foundry knowledge scattered broadcast, irrespective of locality and peoples, deeming the good of the individual included in the good of all.

In his presidential address Mr. Buchanan urged that the well known exclusiveness and secretiveness of the British foundryman give way to more liberal tendencies, as in the interchange of opinion the whole of the industry would benefit. Wages and labor were to be excluded from the deliberations, and only the art of founding itself in all its branches considered. Turning to more concrete matter, Mr. Buchanan discussed the cooling curves of cast iron showing three distinct arrests during the process, corresponding to 2,040 degrees F., and also 1,715, and 1,580 degrees respectively. The relation of the constituents of cast iron were next dwelt upon, as also sulphur in coke. Cold and hot iron, and the oxidation theory as affecting the strength of cast iron concluded the technical side of the address. Mr. Buchanan finally made a plea for better care of employes, and discoursed on the gradual improvement noticeable in British foundries at the present time, in regard to equipment and management.

In the afternoon session Mr. Percy Longmuir described the microstructure of metals, giving his method of polishing and etching, and exhibiting many photographs. He explained how in cooling, the metals rejected what was impure, and thus left pure crystals surrounded with an envelope of the baser ingredients. Fracture always takes place along these planes, and hence the strength of a metal is really that of this impure envelope. Annealing was also taken up, that for simply removing the strains, and the more important annealing for the change in carbon structure, being discussed at length.

The final paper was by Mr. W. T. Maccall, on "Strength Tests of Cast Metals," in which he described the various methods of testing, and the machines for doing it. He advocated a turned bar with cylindrical heads, which could be put within split grips. American engineers prefer a screw thread grip, held in sockets with ball joint.

The discussion of this paper resulted in the promise to have work done along the line of testing cast iron during the year, so that a report may be had at the next convention.

A "smoking concert" wound up the evening, and a visit to the British Westinghouse Co. works, as well as other establishments took up the final day of this interesting convention.

Milwaukee Foundry Foremen's Association.

THOS. GLASSCOCK, DIST. VICE-PRES., CARE PAWLING & HARNISCHFEGER CO.

The Milwaukee Foundry Foremen's Association held their last meeting July 25th and elected officers for the coming year as follows: President, Henry Beagel, Allis-Chalmers Co., West Allis, Wis.; vice-president, Mr. Marshall, superintendent Smith Steel Casting Co.; treasurer, Peter Scott, Filer Stowel Co.; secretary, W. Beck, superintendent Brand Stove Co.; Hank Paulis, master at arms, Nordburg Eng. Co. The meetings were omitted during the month of August. The next meeting is to be held September 6th. A banquet is to be given after the meeting.

A New German Foundrymen's Movement.

It would seem that the Foundrymen's Association of Germany, as at present constituted, does not fill the bill completely, as only firms are enrolled, and prices and labor take the lead in the deliberations. Until recently, in fact, foundry practice was hardly touched upon.

A change is now proposed to follow more closely the lines of the American Foundrymen's Association, and also the English movement now bidding fair to be successful.

The efforts of Giesserei-Zeitung to call into life an association to deal with purely technical problems resulted in an informal gathering of foundrymen on the invitation of members of the German Iron and Steel Institute. Among those present was Dr. Wuest, who is already well known in this country through his efforts to advance the foundry interests of his country along educational lines. By vote of the gathering it was decided not to form a new association, but to extend the usefulness of the existing society by laying special stress on the technical side of the convention deliberations. An executive committee was elected to work out the problem and submit the results at the coming convention of the German Foundrymen's Association. It was advised that individuals should be permitted to join the association as well as firms, and that an Association Journal be established.

We shall note with much interest how the program works out, our American experience in combining technical matters with labor and prices not being at all satisfactory. The men who come to a convention to learn the best way to fight the union, as a rule, do not care to hear shop talk, and vice versa.

Whatever may turn up, one thing will be of value to us, and that is the publication of more and more valuable papers on foundry practice. We can all use this class of information, and the new German departure has our best wishes for a complete success.

Cleveland Foundrymen's Association.

W. H. NICHOLLS, 608 GORDON AVENUE, DISTRICT VICE-PRESIDENT.

On Sunday, August 7th, the association held its first annual outing at Brady's Lake, on the Pennsylvania R. R., and all present certainly passed a very enjoyable day. All the largest foundries of Cleveland are represented in this club and practically all had representatives on the outing. The trip to and from the lake was made in a special car tendered to the foremen by the Pennsylvania Co., the car being comfortably full.

On arriving at the lake refreshments were

W. H. NICHOLLS, HUGH MACKENZIE, AND CHAS. OHLSEN.

served, after which a line up of two sides was made, for the first game of baseball, the guests playing the members. After five innings the game was called in favor of the guests. The crowd then returned to the hotel, where they partook of light refreshments and cigars. Later the band led the merry crowd to the hotel dining room, where an elaborate luncheon was served. After luncheon several songs and solos were rendered by different members of the club, among whom Chas. Ahrens, of the Bowler Foundry Co., and Mr. Rushford,

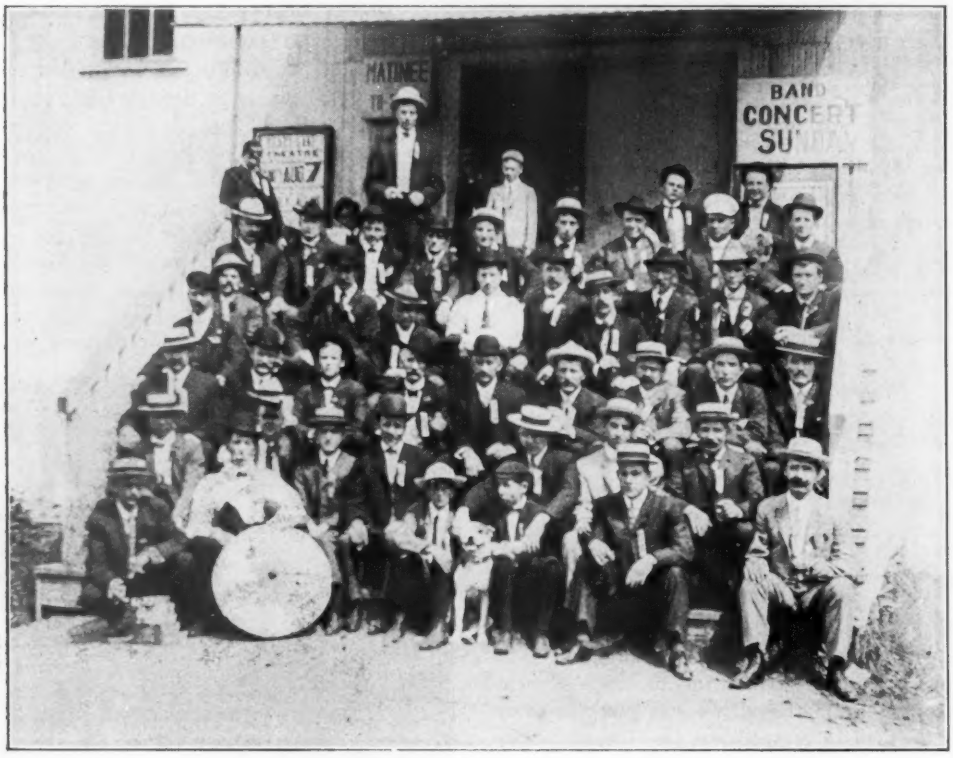
of the Tyler Wire Works, were prominent.

After luncheon the crowd was photographed by Mr. Nicholls and then all went to the lake to witness a boat race of six contestants in which Mr. Wm. H. Nicholls took the first prize. This was followed by running races and other sports, among which was the fat men's race, in which big Michael Cahill, of the City Foundry Co., afforded plenty of amusement.

Another game of baseball was then played, in which the members were victorious over the guests. Some of the party indulged in fishing, boating, shooting, etc., and in the evening the weary, but happy, party and their guests returned to the city. The weather was fine and there was nothing to mar the pleasure of the day, so that the first annual stag outing of the Cleveland Club of Associated Foundry Foremen will long be remembered by those who were present.

The officers of the club are: Hugh Mackenzie, president, of the American Ship Building Co.; John Ryan, of the Kilby Mfg. Co., is first vice-president; Charles Ohlsen, of the Johnston & Jennings Co., is second vice-president; Wm. H. Nicholls, of the Hill-Clutch Co., is secretary and treasurer.

Those present were as follows: Members—John Lewis, John Harsh, Frank Dailey, Michael Cahill, Joe MacGlynn, Walter Jackson, Wm. Dickinson, Chas. Ohlsen, Wm. Kerr, Hugh Mackenzie, A. L. Hott, F. L. Waltner, Wm. Richards, Chas. Ahrens, Sebastian Snider, Wm. H. Nicholls. Guests—Harry Grunan, Ralph Gibbons, Parry Geitz, Dave Blackel, Chris Jansen, Wm. Milinski, A. H. Chappelka, Joe Knorr, Wm. Knorr, Earl Knorr, Wm. Rushford, J. H. Young, Wm. H. Kreiger, Michael Haas, Joe Wedersick, Al Brunst, Fred Abel, Mailen Kipp, Chas. H. Erickson, Geo. H. Rolinson, Henry Ditson, R. S. Keippie, Art Knight, W. Saunders, John Zaycek, Phil Frankel, Chester L. McIntyre, Myron E. McIntyre, Sol Maxwell, Chas. W. Stevenson.



CLEVELAND FOUNDRY FOREMEN'S CLUB AND FRIENDS.

NEW ENGLAND FOUNDRYMEN'S ASSOCIATION.

Fred F. Stockwell, Secretary, care of Barbour-Stockwell Co., Cambridgeport, Mass.

THE PHILADELPHIA FOUNDRYMEN'S ASSOCIATION.
Howard Evans, Secretary, care J. W. Paxson Co.

PITTSBURG FOUNDRYMEN'S ASSOCIATION.
F. H. Zimmers, Secretary, care Union Foundry & Machine Co.

THE ASSOCIATED FOUNDRY FOREMEN.
Frank C. Everitt, Secretary, 2413 Third Ave., New York, N. Y., care The J. L. Mott Iron Works.

ERIE FOUNDRY FOREMEN.
W. F. Gruman, Dist. Vice Pres., care Erie City Iron Works.

CHICAGO FOUNDRY FOREMEN.
David Spence, Dist. Vice Pres., 142 Bunker St.

NEW YORK FOUNDRY FOREMEN.
S. M. Williams, Dist. Vice Pres., 221 Third St., Elizabethport, N. J.

INDIANAPOLIS FOUNDRY FOREMEN.
W. H. Holmes, Dist. Vice Pres., care American Foundry Co.

Slagging a Cupola.

BY N. W. SHED.

In speaking of slagging a cupola in the August number Mr. Doyle says the ash contained in an amount of fuel equal to the bed is locked up so that it cannot enter the slag.

This locking up is not very secure, for the moment the coke is burnt, the ash must be slagged. If there is no lime there to flux the ash, then the melting iron must act as a flux, and by Mr. Doyle's and Mr. Keep's method the iron furnishes the necessary flux at a cost of $13.50 per ton. In my practice it is cheaper to have the lime there at $1.50 per ton. Let Mr. Doyle have his first cinder analyzed and see just how much iron is being wasted as a flux. He speaks of lime absorbing heat. Does not the iron consumed as a flux absorb heat also? In fact, our coke melts just as much iron with 500 pounds of limestone on the bed as it did when we used no limestone. I am still looking for any sound objection to the use of lime in the first charges.

The Timblin Engineering & Foundry Co., of Creighton, Pa., has been incorporated with a capital of $10,000. The incorporators are: George A. Timblin, E. O. Graham, and A. M. Momer.

The foundry plant of the defunct Heating, Ventilating & Foundry Co., Elm Grove, Wheeling, W. Va., will be sold September 3 by the receiver.

SCRAP

The Mud Pie Foundry.

No humorist who understood the foundry trade could begin to write it up in as interesting a style as the newspaper man who knows nothing about it. The following are some extracts from an article which recently appeared in a prominent daily paper:

Six tons of iron hung in a great ladle by chains from a traveling crane. They were ready for pouring. All day the nerve-tearing clatter of pneumatic tools with which workmen were cleaning off rough edges of cold castings had filled the foundry. Now in the middle of the afternoon the noise ceased. Earthy smells rose from the black sand under foot. Through the high windows, with their many small, unwashed panes, the sun sent his thick beams slanting through the smoky foundry gloom. At the side beneath the windows lay the great flask, the mold. The casting is to be a huge iron punch, to weigh more than five tons. Opposite stands the high cupola, from which tons of molten metal were drawn into the great ladle, now hung smoking between the two.

In the crane overhead, the engineer bends with his hand on the lever. At one side beneath, with his strong hands on his hips, stands the foreman, once a United States infantry soldier. His brown eyes, beneath heavy eyebrows are keen. He wears a battered old black slouch hat, pulled down; a faded blue working shirt, with the sleeves rolled up. His hair is tinged with gray. A sandy red beard of several days' growth is on his face. About his mouth are lines of grim good humor.

Over close by the ladle stands the molder, a slender man, the expert who built the flask, and now will pour the casting under the foreman's guidance. The skill and judgment of both men and the work of others is now to be tested. Should the casting be unsuccessful the labor of days of preparation is lost and everything must be begun again from the beginning.

Four days ago the foreman gave the molder the big wooden pattern for the punch and told him what was wanted. Other molders were put to work with him. A pit was dug in the earth floor to hold the pattern. Sand was

stamped down carefully about it. When, with the crane, the wooden pattern was lifted out, its impression was left in the firm moist sand. This was to form the "drag," the lower half of the mold. With little trowel like tools the molder and others went over this form, smoothing it up and removing every loose or misplaced crumb of sand. "Cores," built in another department to form opening or depressions in the finished casting were set in place. The inside of this form was painted with "lumbago" to make the surface smooth and prevent the molten iron from sticking in the sand.

In a like way the upper part of the mold, the "coke" was built in an iron frame. These were "skin dried" with a fire of charcoal built in them. The "coke" was lowered by the crane upon the "drag" and weighted there in place with 22 tons of iron in blocks.

All this and more had been done by noon. In the morning the fires in the cupola were started. Workmen on a platform under the roof were putting in alternate layers of coke and iron. Molten iron lay in a pool inside the cupola at the bottom.

The great ladle, heated by a fire built inside, was lowered to the ground at the base of the cupola. With a long rod, the molder tapped the cupola, and a two inch stream of the molten iron, yellow white, ran through an open spout into the ladle. From the ladle there flashed a shower of iron sparks that broke in sunburst like forms in the air. Three taps, more molten iron having collected each time at the bottom of the cupola, filled the ladle. With a rumble and grinding of cogs and well oiled chains, the great hook of the crane was lowered again. The ladle was swung slowly across to the mold.

The pouring attracted the attention of less than half a dozen men. Others all about, most of them in under shirts, with sleeves rolled up over brawny, grime-black arms, were building other "drags" and "cokes," or "cheeks," as the center section of three piece flasks are called.

Gradually the ladle is lowered opposite the great flask. The molder is at the "geared" wheel on the ladle by which it is slowly tilted. A man on the other side steadies the ladle. The foreman is on top of the flask "All right," he says. The wheel in the molder's hand turns a space more. A stream of molten iron is running over the ladle's edge down through a lip of sand, the "runner," into the mold.

From vents built all around the flask gas flames shoot high. Not once until the ladle is nearly empty do the molder's eyes leave the stream or the wheel in his hands cease its slow turning. The foreman's eye catches the appearance of metal in the "riser," a test opening in the top of the flask. He speaks and the pouring stops.

For an hour longer, while an assistant brings small hand ladles of iron from the cupola, the molder churns it down into the mold through the riser in the top of the flask. That is "feeding." It makes the casting full and perfect. Otherwise the top would sink like a sponge cake gone wrong.

A Small Fire.

The following clipping from a newspaper records apparently a wonderful occurrence:

"The fire department was called to the ——— works Saturday evening, where several castings in the foundry were noticed burning by the nightwatchman. The blaze was soon put out, without any damage."

A Ponderous Casting.

The following statement appears in the *Minneapolis Tribune*.

BIG CASTING. The freshmen in the University foundry will make the largest casting ever attempted at the university on Saturday, when a lathe bed weighing 1,200 pounds will be made. The members of the engineering class have been working in the foundry for over two months building the mold of the immense casting. This has been completed, and the iron will be melted and run into the mold Saturday under the direction of E. A. Johnson, the director of the foundry work.

TRADE PUBLICATIONS.

H. S. Vrooman has issued a neat pamphlet 3½ by 6 inches, entitled "A Treastise on Molding Sand," and it will be found that it contains many points that will be of interest to all foundry men.

The Jos. Dixon Crucible Co. have just issued a 4-page folder telling of the renewal of a contract with the mint of a foreign government for its supply of crucibles.

The University of Wisconsin has published and is sending out a description of their department of electro-chemistry. They have made a specialty for some time of electrolytic and electro chemical work, and are remark-

ably well equipped for this. The pamphlet which they are sending out shows illustrations of their laboratories and apparatus, together with a description of the same.

Emery and corundum wheels are manufactured of many different numbers or sizes of grain, and also many degrees of hardness to meet the great variety of conditions under which they are used. Explanations of numbers of emery and grades of wheels is given in a leaflet published by the Star Emery & Corundum Co. of Detroit.

It has been the practice of wood split pulley manufacturers to publish small catalogues or booklets describing their production. The Reeves Pulley Co., Columbus, Indiana, has published a more elaborate catalogue describing its pulleys fully with illustrations and considerable valuable information.

The Diamond Drill & Machine Co., of Birdsboro, Pa., have published a catalogue describing their cold saws, of which they make a large variety for all classes of work. Steel foundrymen would be especially interested in their special steel casting type of cold saws.

Geo. G. Blackman, Sons & Co., of Liverpool, England, have just issued the fifth edition of their booklet entitled "Solid Ingots and Castings," which is devoted to the uses of their S. A. M. alloy. In this book they set forth in detail the advantages of this material to both iron and steel foundries. The catalogue mentioned should be of interest to all foundrymen as should also several of their other books and catalogues treating on fluor spar, and other products which they handle.

R. D. Wood & Co., of Philadelphia, Pa., are sending out their St. Louis exposition edition of their catalogue entitled "Gas for Power and Fuel."

The Blaisdell Machinery Co., of Bradford, Pa., have issued a catalogue entitled "Bulletin No. 12," in which they describe the line of self-oiling air compressors manufactured by this company.

The Springfield Testing Laboratory, of Springfield, O., have sent out a very neat little folder entitled "Sparks from the Cupola," in which they give some very pertinent statements concerning the relationship of the laboratory and foundry and calling attention to the fact that they are ready to assist foundrymen with a new and well equipped laboratory.

The Henry S. Worthington Co., of New York City, have issued a small catalogue describing the Worthington steam accumulator for use in connection with all kinds of hydraulic machinery, such as elevators, etc.

The Newton Machine Tool Works, of Philadelphia, Pa., have just published a catalogue of their cold saw cutting off machines, in which they show a large variety of machines, many of which are driven by direct connected motors. They have special types for use in steel foundries, as well as the standard machines for cutting bars, plates, etc.

The Bristol Co., of Waterbury, Conn., have issued a catalogue of the Bristol recording pressure and vacuum gauges. This catalogue contains considerable material of interest to all users of gauges, but we do not see why this company should continue to publish a catalogue 9½ by 12½ inches, when practically everybody else has adopted the standard size.

PERSONALS.

Mr. Robt. Campbell, of Gadsden, Ala., has been placed in charge of the plants of the Central Foundry Co., located in Bessemer and Gadsden. The Gadsden plant has not been in operation for some time, but will be started at once. Mr. Campbell is mayor of Gadsden.

L. N. Harris, for the past two years superintendent of the United States Cast Iron Pipe & Foundry Co.'s plant at Bessemer, Ala., has resigned and W. R. Nicholls, for a long time master mechanic, has been appointed to the vacancy. Mr. Harris and family will remove to Birmingham, where he will go into business.

W. H. Kelly has been appointed foreman of the plant of the Youngstown Foundry & Machine Co. He was formerly superintendent of the Buckeye Engine Co., Salem, O.

James Boyle has succeeded W. H. Kelly as superintendent of the foundry of the Buckeye Engine Co., of Salem, O.

Charles E. Howlett, of New York, has been appointed manager of the American Steel Casting Works, at Chester, Pa.

Mr. Jos. Harrison, for thirty years foreman of the Allis-Chalmers foundry, in Milwaukee, has accepted a position as salesman for the J. D. Smith Foundry Supply Co., to travel in Wisconsin, Minnesota and Michigan.

Mr. Steve Wright, formerly with the Dutcher Steel Co., has accepted a position with the National Electric Co., as superintendent of their iron, steel and brass foundries.

Thos. Cameron has been appointed assistant foreman of the Buffalo Foundry Co., Buffalo, N. Y.

DEATHS.

Mr. John F. Starr, president of the First National Bank, of Camden, N. J., died at his summer home in Atlantic City, on August 9th, at the age of 86 years. In 1862 he was elected to Congress and was again elected in 1864, representing the first district of New Jersey. Mr. Starr was the founder of the Starr Iron Works, now the Camden Iron Works, of Camden, N. J.

Carl Gutsche, who worked at the Collinwood shops of the Lake Shore Railroad, was knocked from a work train and killed while on his way to work on August 18th. He was the son of J. A. Gutsche, foreman of the foundry at Collinwood.

J. F. Casey, one of the leading manufacturers of Chattanooga, Tenn., died August 15th after an illness of nearly two years. Mr. Casey was born at Yellow Springs, O., in 1855 and was admitted to the bar at Springfield, O., where he practiced for several years successfully. He removed to Chattanooga in 1888 and formed a partnership with M. M. Hedges, and in 1889 bought the old Union Iron Works, which was then in the hands of a receiver. Soon after the Casey & Hedges Mfg. Co. was incorporated. In 1893 the company erected the plant which is now operated. One year later Mr. Casey and Mr. Hedges organized the Chattanooga Pipe & Foundry Co., of which concern Mr. Casey was president. Under the will of Mr. Casey his properties are left absolutely in the hands of Mr. Hedges.

Mr. V. T. Palmer, president of the Palmers & De Mooy Foundry Co., of Cleveland, O., died at his home in Cleveland on Aug. 4. Mr. Palmer was born in Warrensville, O., in 1843. The greater part of his life has been spent in Cleveland, where he has been engaged in a number of business enterprises. Twenty-three years ago, with Wm. De Mooy, he started the company of which he was president at the time of his death.

David J. Matlack, who for 55 years was superintendent of the iron foundry of the Cramp Shipbuilding Co., died suddenly of heart disease July 25 at his home in Langhorne, Pa. He was born in Philadelphia 73 years ago. The day of his death he had just completed the castings for the largest turbine wheel ever made, it being capable of developing 12,500 h. p. He was a member of the American Society of Mechanical Engineers.

Mr. Oliver C. Stanley, of Providence, R. I., died on July 19. Mr. Stanley was formerly foreman of the foundry of the Providence Machine Co., and later of the Brown & Sharpe Mfg. Co. He retired from business about 15 year ago and has been living with his daughter. He was 87 years of age at the time of his death.

FIRES.

The H. Mueller Mfg. Co., of Decatur, Ill., had its brass foundry partially destroyed by fire on Aug. 16th.

The Co-operative Stove Foundry Co., of Rochester, N. Y., was visited by fire on August 6th. The employes were attending a picnic at the time and hence the fire was not discovered until it had made considerable headway. Fortunately the fire was gotten under control before it had done very much damage.

Fire on the night of July 18 in the plant of A. L. Hayes & Co., stove manufacturers, Nashville, Tenn., resulted in damage estimated at $25,000, covered by insurance.

H. Dixon's foundry, at Collingwood, Ont., was damaged by fire to the extent of $8,000 on July 27. The insurance is estimated at $2,000. Mr. Dixon will rebuild at once.

A disastrous fire visited the town of Fresno, Cal., July 11, destroying a number of manufacturing plants, including the Valley Foundry & Machine Shops.

Fire in the foundry of the Locke Regulator Co., Salem, Mass., July 28, caused a loss of $5,000, covered by insurance.

NEW CONSTRUCTION.

The Berlin Machine Works, Beloit, Wis., are building important additions to its plant as follows: machine shop 150x200 ft., pattern building 80x200 ft. three stories, office building four stories, pump house with 40,000-gallon reservoir. Late last year the company added to its product a line of band resawing machinery, which has become so popular that the increase of facilities for manufacturing has become necessary. The company has been very prosperous and is growing rapidly.

The International Gas Engine Co. will erect a plant at La Porte, Ind. The buildings include a foundry, machine, erecting and pat-

tern shops, a large warehouse, laboratory and office. The cost will be $150,000.

The Nagle Engine & Boiler Works, Erie, Pa., will build an addition 120 x 250 ft. which will be used as a foundry.

The Geiser Mfg. Co., of Waynesboro, Pa., is enlarging the foundry in connection with its plant in Greencastle, Pa., by constructing an additional building adjoining the old structure.

The plant of the Woodcock Foundry Co., Chillicothe, O., has been purchased by the Logan Motor Carriage Co., of that city, which recently increased its capital stock to $100,000. The plant will be remodeled and new machinery installed.

The Illinois Foundry & Engineering Co., Edwardsville, Ill., has laid the foundation for a building of its plant, contracts for material are being let and if weather conditions remain favorable the plant will be in active operation by Oct. 1. The plant will be 69 x 100 ft. and will be equipped with traveling cranes the full length of the shop, 31 ft. span. The officers of the company are as follows: E. M. Miller, president and general manager, Edwardsville, Ill.; A. W. Price, secretary and treasurer, Cleveland, O.; and A. J. Miller, vice president, St. Louis, Mo.

The Carbondale Foundry & Machine Co., of Carbondale, Ill., has purchased five acres of land a short distance from the Marion junction of the Coal Belt railway and will erect a large foundry and machine shop for making mining and other machinery.

Morris & Lewis, Rock Island, Ill., have awarded a contract for the erection of a foundry for the manufacture of a patent railway shoe brake. The building will be one story, 172 x 100 feet, and will cost $15,000. It is to be completed in ninety days.

The Buckeye Engine & Foundry Co., Joliet, Ill., has completed its main plant, having a floor space of about 20,000 square feet. There is also a foundry and the company expects to add another building 40 x 100 ft.

The Clare Furnace Co., Clare, Mich., has taken over the entire business of H. B. Wells & Son and is beginning the erection of a permanent plant. The foundry and machinery of Wells & Son have been moved from Ithaca, Mich., to Clare.

L. P. Larson, who has been operating the Gainesville Machine Works, Gainesville, Fla., under lease, has purchased and will enlarge the plant. He will also build a foundry.

Strickland Bros., Tuscaloosa, Ala., commenced work on their new foundry and machine shops on property recently purchased The building will be completed about Sept. 1.

The Cannon Pump Mfg. Co., of Waycross, Ga., capitalized at $25,000, has let the contract for a plant at North Birmingham and the work of construction is now proceeding.

Ground has been broken for the erection of the Humbolt Machine Shops, Humbolt, Tenn. The enterprise is promoted by Messrs. Allison, Hudson and Follis. It is expected that the plant will soon be in operation.

GENERAL INDUSTRIAL NOTES.

The Massachusetts Steel Castings Co. has been incorporated under Massachusetts laws with a capital of $500,000. The principal office is at Everett, Mass., and the company is practically a re-organization of the United States Steel Co. The incorporators are: Robert M. Morse, Boston; William G. Richardson, Cambridge; John M. Graham, Boston.

The New England Steel Castings Co., Hyde Park, Mass., has been incorporated with a capital of $30,000. President, Eugene Edwards, Boston; treasurer, John W. Johnson, Boston; secretary, William Montgomery, Newton, Mass.

The Star Brass Foundry, of Jamestown, N. Y., has been started by Gunner Gunnell, Isaac Anderson, John W. Peterson, David Carlson and Olof Gunnell. The members of the new firm are all experienced brass and bronze workers, and they expect to do a general line of brass and bronze castings.

Mr. Wm. H. Armstrong, formerly manager of the New York business for the Chicago Pneumatic Tool Co., is now associated with the Ingersoll-Sergeant Drill Co., of 26 Cortlandt street, New York, and will look after the interest of the pneumatic tool department.

The assets of the Bromley Foundry Co., Albion, N. Y., have been sold at auction to W. T. Bromley for $1,535. It is expected that the company will pay about ten cents on the dollar.

The Windsor Pump & Foundry Co., Windsor, Ont., recently incorporated, has elected the following officers: President, George McLeod; vice president, A. L. Thibodeau; secretary-treasurer, E. A. McCleary; manager, N. Beneteau.

The Champion Funding & Foundry Co., Burlington, Ia., will soon purchase equipment for its machine shop and foundry.

The Petroleum Iron Works Co., Washington, Pa., will move its plant to Arden Station, near Washington, where it has purchased a plot of 17 acres. The company's plant has been crowded with work to such an extent that removal has become necessary. The business was established in 1892, when the company purchased the Thomas Morrison Foundry. A new location was obtained in 1894, but such rapid progress has been made that the plant is not large enough to meet the demands.

Menzel & Jeffery, of Minneapolis, Minn., have moved into their new foundry, which cost them about $25,000. They have conducted business in the old plant for eleven years.

The Bessemer Foundry Co., which was recently incorporated in the state of Delaware and has applied for a charter in the state of Pennsylvania, will locate their plant in Grove City, Pa. The capital stock is placed at $12,000.

The new plant of the York Foundry & Machine Co., York, Pa., will be in operation by Sept. 1. The building is of brick, 23 x 100 ft.

If the court at Galion, O., confirms the sale of the machinery and stock of the Flickinger Wheel Co. to J. W. White, of Terre Haute, Ind., Mr. White expects to organize a company to engage in the manufacture of wheels at Galion. The sale of the property of the Model Gas Engine Co., Auburn, Ind., to Mr. White was not approved by the court.

The Sterling Foundry Co., 940 West Fifth street, Cincinnati, has made an assignment to C. C. Archer. The assets and liabilities are each placed at $4,000.

The plant of the Anderson Malleable Iron & Mfg. Co., Anderson, Ind., has been sold to David C. Miller and J. A. Ross, of Greenville, O.

Born Bros., of Belleville, Ill., have added a foundry to their machine shop.

The new foundry of the Gisholt Machine Co., at Madison, Wis., is now in operation. The construction and equipment have cost about $50,000.

The foundry of the Hall Mfg. Co., Austin, Minn., has been purchased by the Pishkey Bros. The Hall company will continue to operate its machine shops.

The Grand Rapids Foundry Co., of Grand Rapids, Wis., has filed an amendment to its articles of incorporation increasing its capital from $12,000 to $20,000.

The Lehigh Coal & Navigation Co. will enlarge its foundry and machine shops at Lansford, Pa., by the erection of new buildings and the installation of more modern machinery.

The German-American Foundry Co., recently incorporated, will operate the foundry at Boonton, N. J., formerly operated by the New York Agricultural Co. The officers of the new concern are: Henry Krueger, president; John Sharkey, vice president; Oscar Rohland, treasurer; J. J. Cunningham, secretary and general manager. These officers formed a co-partnership last November, but the business increased so that it was decided to incorporate. The company manufactures machinery castings, principally for rolling mills and blast furnaces.

The Lindsey & Addison Foundry & Machine Works, of Pomona, Cal., has been taken over by a new corporation known as the Addison Pump Co., with headquarters in Los Angeles.

Bay City Iron Works, Bay City, Texas, have been incorporated with a capital of $10,000. The incorporators are: R. B. Crockett, T. O. Crockett, S. E. Delary.

The O. K. Foundry & Machine Co., of Chanute, Kansas, opened their new plant by inviting the mayor and the citizens to see the first casting.

A dispatch from Guadalajara, Mexico, gives some further information regarding the iron and steel enterprise in which Ralph H. Beach, until recently manager of the railway department of the General Electric Co., and George Townsend, of Indianapolis, are interested. Mr. Beach is now at Guadalajara and will devote his attention to the iron mines, mills and foundry at Ferreria de Tula, State of Jalisco, which have been leased for ten years, with an option to purchase for $700,000. The lessees expect to build up one of the most important manufacturing enterprises in the Mexican Republic. There are now in operation a foundry, rolling mills and machine shop, and the output this year will amount to 2,500 tons of iron bars and castings. It is proposed to increase the capacity to 18,000 tons a year. The building of a steel plant is included in the plans.

The Indiana Foundry & Machine Co., of South Bend, Ind., are making additions to their plant, in order to equip it for their increasing business.

The Lorain Machine & Forge Co., Lorain, O., will add a foundry to its machine and forge shops.

The Bridgeport Foundry & Machine Co., Bridgeport, Conn., which has an authorized capital of $50,000 and will begin business with $2,500, has been incorporated. The incorporators are: Rollin D. Whipple, Charles N. Choate and Charles E. A. Thompson.

At the office of the Secretary of State in Albany, N. Y., a certificate of incorporation has been filed by the Morse Dry Dock & Repair Co. as the successor of the Morse Iron Works, Brooklyn, which went through bankruptcy proceedings last October. The plant at one time employed 2,000 men. The incorporation of the new company practically insures a resumption of active operations. The company is capitalized at $600,000. The directors are: Daniel J. Leary, E. P. Morse, John P. Caddagan and George Leary of Manhattan, and William C. Reid of Brooklyn.

The Brylgon Steel Casting Co. is disman tling its shops at Reading, Pa., preparatory to removal to New Castle, Del. The new plant when in full operation will employ about 250 men.

The Gardner Convertible Steam & Gas Engine Co., Washington, Pa., is erecting a machine shop 52x100 ft. A foundry will be built later.

The Union City Foundry Co., Union City, Pa., has erected a foundry 70x100 ft., with an ell 50x90 ft. Equipment will be installed this month. General foundry work will be done.

The Smith Pattern Co., of Cleveland, O., has been incorporated with a capital of $10,000. The incorporators are: C. M. Smith, M. A. Stovering, V. Sharp, Alex Klein, and H. W. Ward.

The Stillwell-Bierce & Smith-Vaile Co., of Dayton, O., has been in the hands of a receiver for some time, and on August 12th the plant was offered for sale. The highest bidder was J. D. Platt, who bid $775,000. The plant is appraised at $1,265,870.22. It is probable, however, that the court will accept the bid mentioned. The plant has not ceased operation at any time during the receivership, and will continue under the present management until the matter is decided.

The Eagle Foundry Co., of Muncie, Ind., has been incorporated with a capital of $5,000. The incorporators are: J. Ross Crozier, Harley D. Hartley and Harry Rhoads.

The Electric Steel Casting Co., Matthews, Ind., has been incorporated with a capital of $50,000. Directors are: G. S. Rinebolt, Philip Hughes, Philip Angsten and W. K. Gore.

The Lakeside Foundry Co., of Chicago, Ill., has been incorporated with a capital of $2,500, to manufacture stoves. The incorporators are: H. A. Oberman, N. A. Tighe, and Charles Dolan.

The Southern Illinois Machine & Foundry Co., of Murphysboro, in southern Illinois, has increased its capital from $6,000 to $20,000.

The Western Overdraft Heater Co., Rockford, Ill., has been incorporated with a capital of $10,000 to manufacture stoves, heaters and furnaces. The incorporators are: R. Henry Bruce, Martin A. Banks and Frank S. Regan.

Edward J. Lahan and his associates expect to get their foundry started at Quincy, Ill., late in September. The company will manufacture stoves under a patent obtained by Mr. Lahan.

The Nordberg Engineering Co., Milwaukee, Wis., have leased the Bailey foundry.

The Dutcher Steel Co., of Milwaukee, Wis., have just installed a 10-ton open hearth steel furnace, to replace the crucible furnaces which they have been using.

The Adrian Steel Casting Co., Adrian, Mich., recently incorporated with a capital of $30,000, has organized by election the following officers: President, Charles E. Sutton, Toledo; vice president, Dr. G. B. M. Seager; secretary and general manager, W. N. Swift; treasurer, E. N. Smith. The directors comprise, besides the officers, F. E. Kennedy, E. C. Sword, L. B. Robertson, J. W. Allen, Royal Shacklette and C. G. Wesley, of Adrian, and A. H. Davies, of Cleveland. The company will use the process invented by A. H. Davies, one of the stockholders.

The contract for building the Ensign foundry at Auburndale, O., has been awarded to Frank Stahl and the work will be commenced at once.

Field, Hinchman & Smith, engineers and architects, have let contracts for the new pattern shop and blacksmith shop for the Olds Motor Works, of Lansing, Mich.

Desiring to be in closer communication with the iron manufacturing center, the officers of the Cannon Pump Co., have moved their plant from Waycross, Ga., to Birmingham, which city exempts the concern from city taxes for ten years.

The Southern Steel Works, of Chattanooga, Tenn., have secured a permit for a $4,000 building at their plant in that city. The new building will be 60 by 80 feet, and consist of brick and stone. It will be equipped for the manufacture of steel castings.

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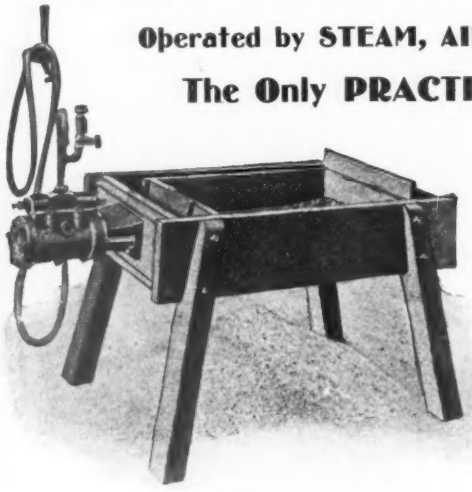

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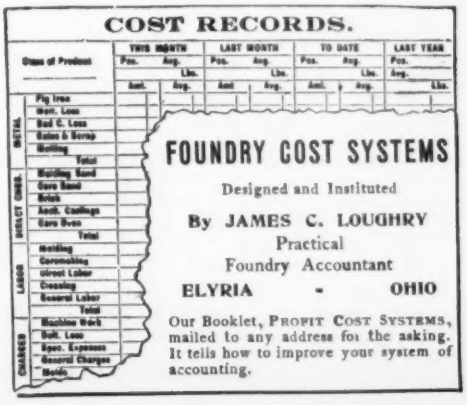

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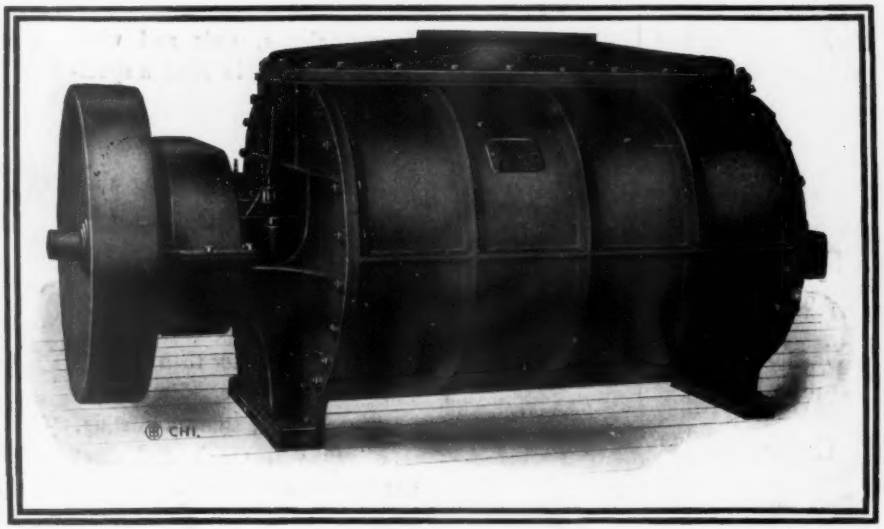

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